A.O.Smith
Water Heaters

SERVICE HANDBOOK

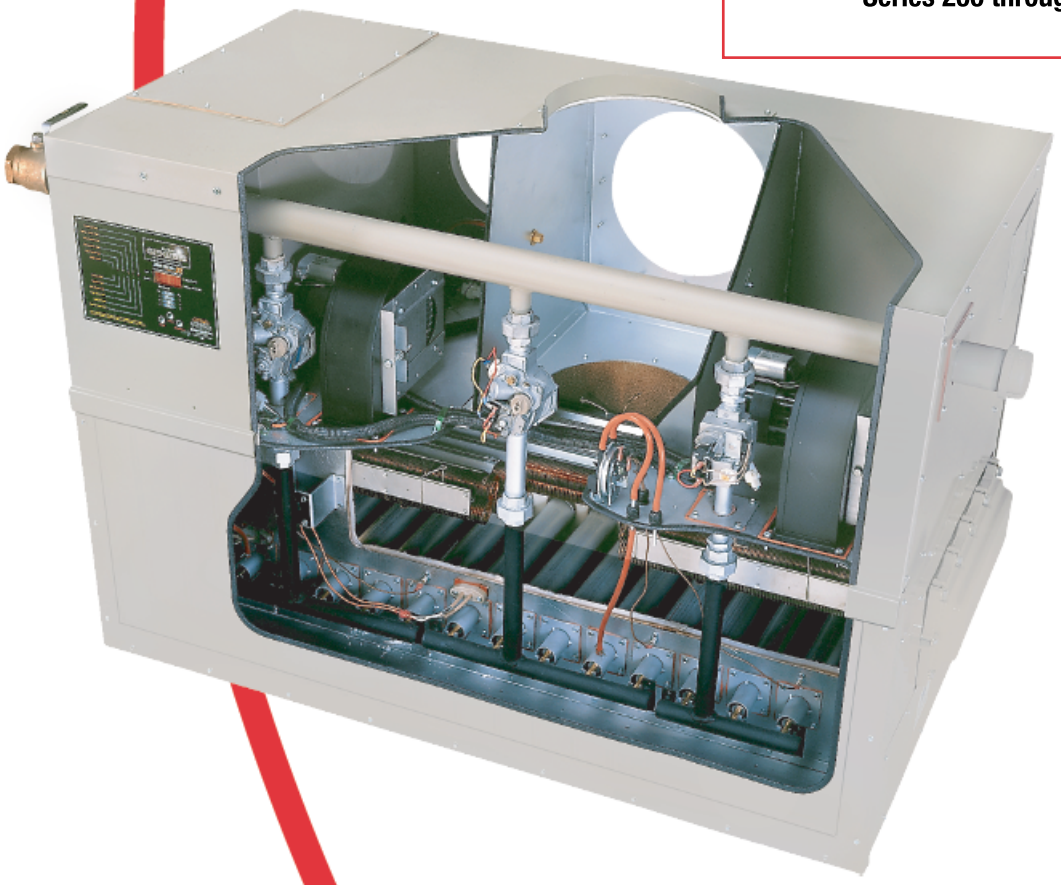
Genesis®

Space Saving
Mid-Range Efficiency
Gas Boiler

MODELS COVERED

GB/GW 1000 through 2500

Series 200 through 201



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SERVICE HANDBOOK
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GENESIS SERVICE HANDBOOK INTRODUCTION

This service handbook is designed to aid in servicing and troubleshooting A.O. Smith Genesis water heaters in the field. No duplication or reproduction of this book may be made without the express written authorization of the A.O. Smith Water Products Company.
The following text and illustrations will provide you with a step-by-step procedure to verify proper installation, operation, and troubleshooting procedures. Additional quick reference data is included to assist you in servicing this product.
The information contained in this handbook is designed to answer commonly faced situations encountered in the operation of the Genesis product line and is not meant to be all-inclusive. If you are experiencing a problem not covered in this handbook, please contact the A.O. Smith Customer Care Center at 1-800-527-1953 or your local A.O. Smith Water Products Company representative for further assistance. This handbook is intended for use by licensed plumbing professionals and reference should be made to the instructional manual accompanying the product. This handbook contains supplemental information to the Genesis instructional manual.

Qualifications: Installation or service of this water heater requires the ability equivalent to that of a licensed tradesman in the field involved. Plumbing, air supply, venting, gas supply, and electrical skills are required.

Tools Required:

- powered screwdriver
- crosstip screwdriver
- a pipe wrench
- a set of marked drill bits
- an electrical multimeter tester capable of measuring continuity and voltage
- gas pressure gauge or manometer
- water pressure gauge
- draft gauge
- thermometer (range 0 - 220 degree F)
- a 1/2 inch drive socket set (USA)
- wire terminals and appropriate tools if electrical repairs are to be made
- 3/16" Allen wrench
- PIO 5/16" nut drive

INSTALLATION

Electrical circuit boards are accessible through panels on the left end or top left of the jacket. Blowers, blower air shutters and gas valves are accessible through the upper, front panels. Burners, hot surface igniters and flame sensors are accessible through the lower, front panels.

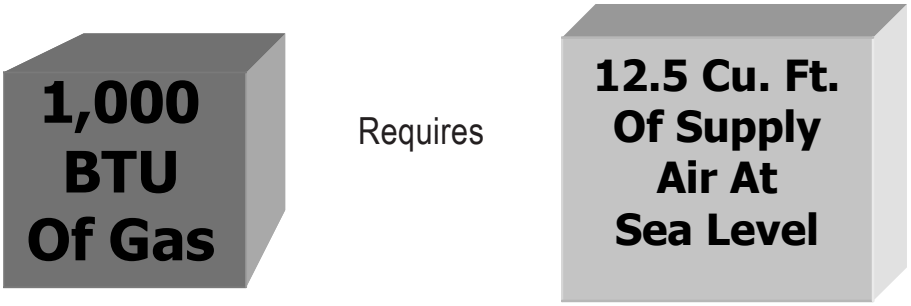
Interior Clearances to Combustibles

These Genesis heaters are approved for installation on noncombustible flooring. They can be installed in an alcove with minimum clearances to combustibles of:

Minimum Clearances to Combustibles						
	Top	Water Side	Blank Side	Rear	Vent	Front
All Models	6" (152MM)	12" (304MM)	3" (76MM)	3" (76MM)	6" (152mm)	Alcove

Note: Approximately 24" is suggested as a service clearance to the front of the unit and 24" from ends of the unit. Also, sufficient clearance on the return end (blank or pump side) is suggested to permit access to heat exchanger tubes for cleaning.

AIR FOR COMBUSTION

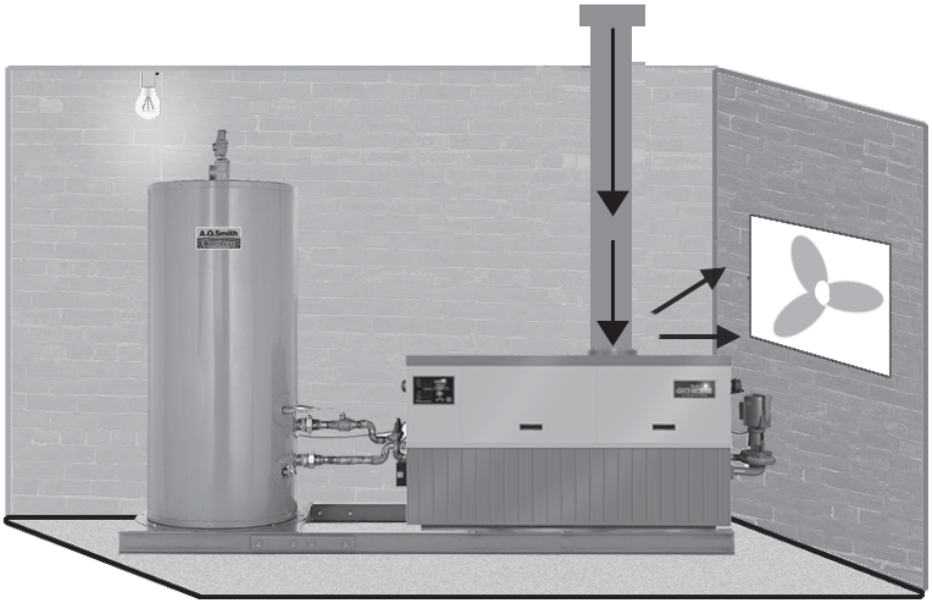


Complete combustion requires 10 cubic feet of air per 1000 BTUH gas input. The National Fuel Gas Code also recommends an additional 2.5 cu.ft. of “excess” air.
The National Fuel Gas Code also specifies minimum make-up air opening sizes for various building installations. (Ref: NFPA 54/ANSI Z223.1). See the installation manual for details.

In calculating the free area of a vent opening, the blocking effect of screens, louvers and grills should be considered. Screens shall not be of a mesh smaller than ¼ inch square. If the free area is not known, the latest edition of National Fuel Gas Code NFPA 54/ANSI Z223.1 recommends using figures of 20-25 percent free area for wood louvers or 60-75 percent for metal grills or louvers.

AIR FOR COMBUSTION

DOWNDRAFT



Insufficient make-up air is a major cause of combustion problems. One common example is a mechanical room where exhaust vent equipment was not considered in sizing make-up air requirements. This may result in air being pulled down the exhaust vent of the Genesis causing flue gas spillage, flame roll out, improper combustion, and/or erratic heater shut down. It can also cause the production of carbon monoxide that could result in serious personal injury or death. In order to assure proper operation, perform a worst case depressurization test as outlined on Appendix H of the 1999 Edition of the National Flue Gas Code (ANSI Z223.1/NFPA-54).

AIR FOR COMBUSTION

CONTAMINATED AIR

Along with adequate make-up air, the quality of the air is important. Contaminants in combustion air can lead to premature heater failure. Vapors from bleaches, soaps, salts, etc. are drawn into the combustion chamber with the make up air and, once fired, mix with water vapor in the gases to form extremely corrosive hydrochloric or hydrofluoric acid and other corrosive by-products. Dust drawn in may build up on the blower or clog the main burner ports. Also, be certain to examine the exterior area around the air intake of a direct vent installation for these contaminants.

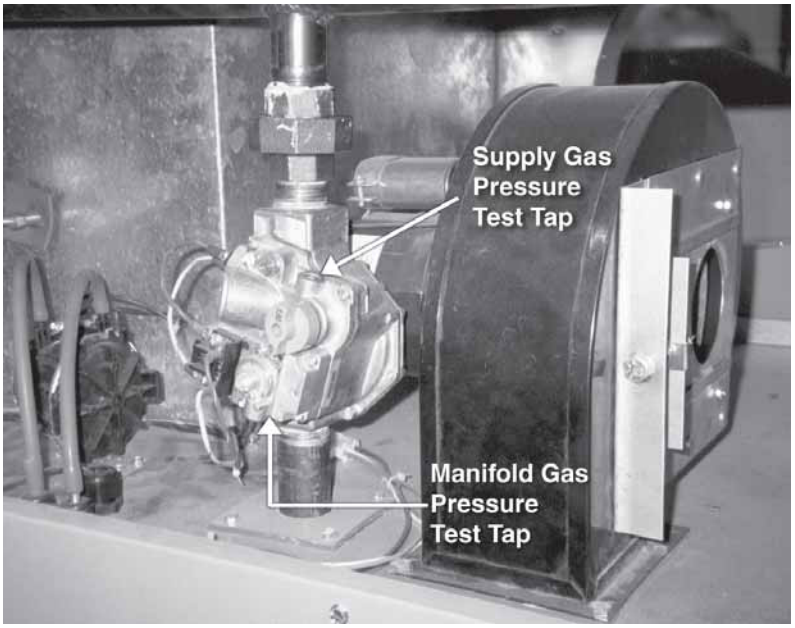
AIR FOR COMBUSTION

FLAMMABLE ITEM

Flammable items or pressurized containers or any other potentially hazardous articles must never be placed on or adjacent to the heater. Open containers of flammable material should not be stored or used in the same room with the heater or in the area of the exterior air intake of a direct vent installation. Direct venting **does not** eliminate the need to remove flammable or corrosives from the area surrounding the heater.

SUPPLY GAS PRESSURES

GENESIS II



The supply gas pressure is normally measured at the dirt leg or at the gas pressure tapping on the supply side of a gas valve. This reading must be measured with 'flowing' gas.

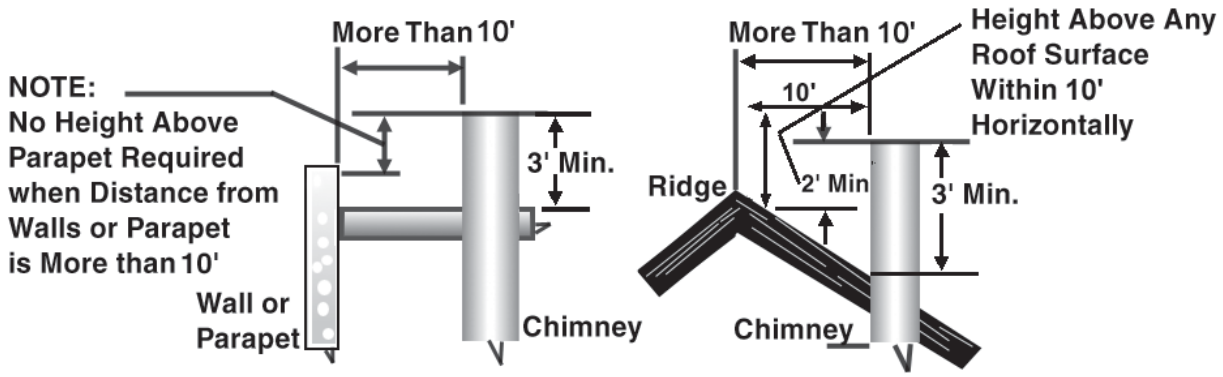
Manifold gas pressure is measured at the manifold pressure tap on the outlet side of each gas valve when the gas is flowing.

See "Gas Connections" section of the installation and operation manual to verify proper gas supply piping installation.

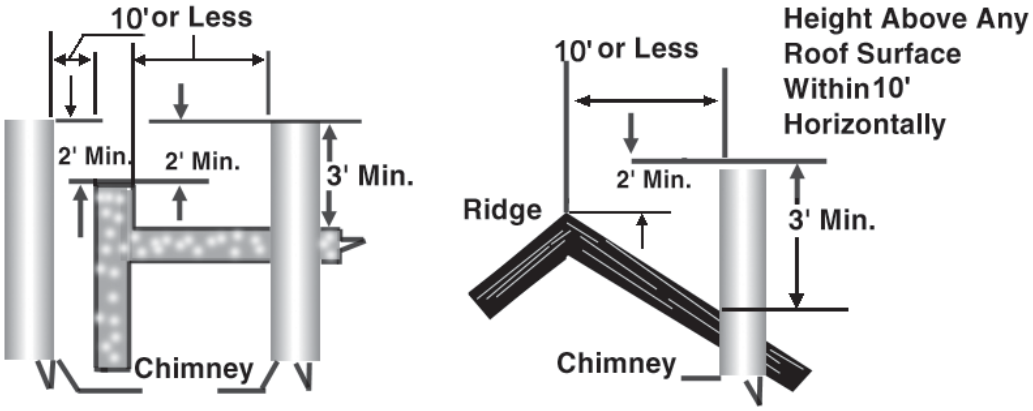
Supply Gas Pressure				Gas Type	Manifold Gas Pressure	
Maximum		Minimum				
Inches W.C.	kPa	Inches W.C.	kPa		Inches W.C.	kPa
13.8	3.49	6.0	1.22	Natural	3.5	0.87
13.8	3.49	11.0	2.74	Propane	10.0	2.49

EXTERIOR VENT CLEARANCES

CATEGORY I INSTALLATION



More Than 10 Feet



10 Feet or Less

This illustrates the exterior roof clearances for Genesis unit with vertical draft venting. A gas vent shall terminate above the roof surface with a listed cap or listed roof assembly. All other gas vents shall terminate not less than 3 ft (0.6 m) above the highest point where they pass through the roof and at least 2 ft (0.6 m) higher than any portion of a building within 10 ft. (3.1 m). (NFPA 54/ANSI Z223.1)
Section 7.6.2 "within 8 ft (2.4m) with listed caps for vents of 12 inches diameter or smaller".

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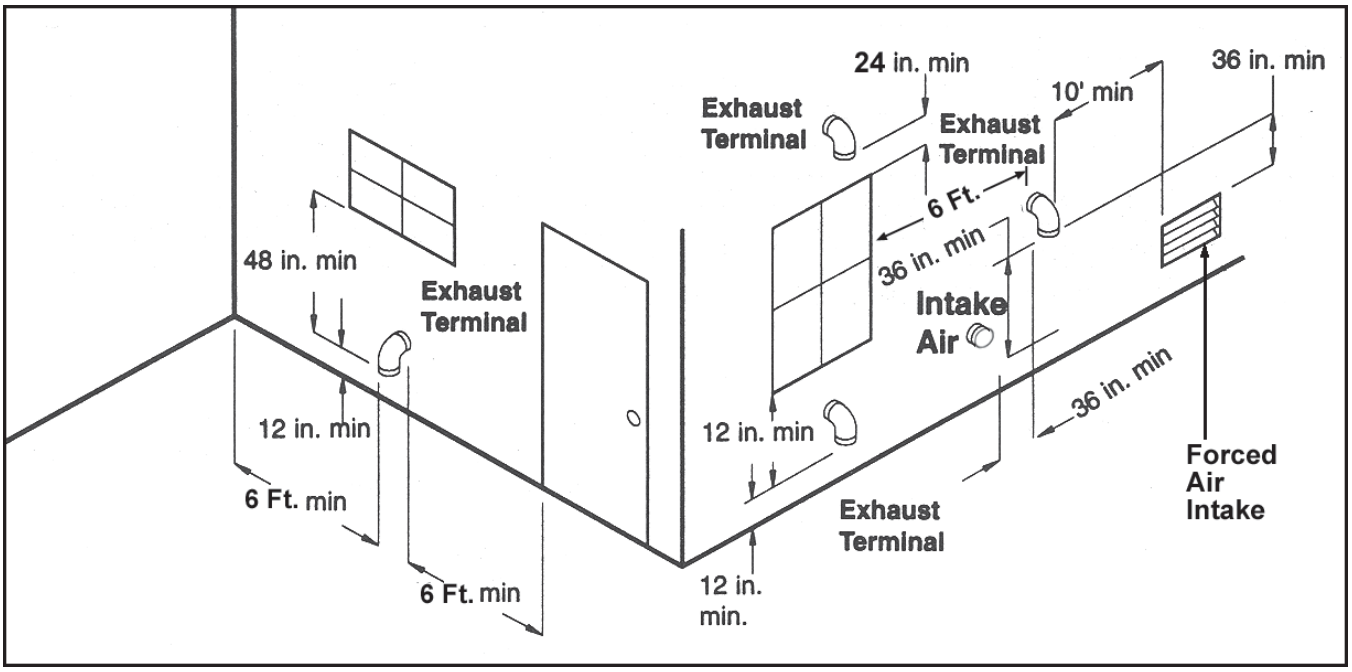
When installed as a direct vent system, follow the manufacturer’s recommended clearances.

VENT TERMINATION



Vent Terminations Installation Clearances Per Manufacturers Recommendations - Sidewall

1. Do not exhaust over a public walkway.
2. Exhaust 6 feet horizontally from gas or electric meter and 48" below or 24" above.
3. Exhaust a minimum of 48" from any soffit or eve vent.

VENTING

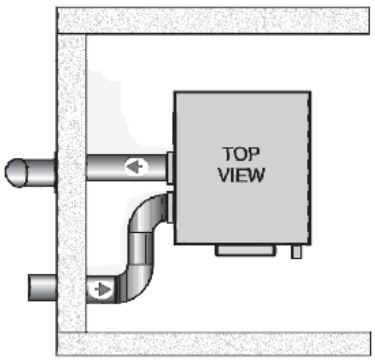
MULTIPLE HEATERS

(When installed as a Category I Appliance)

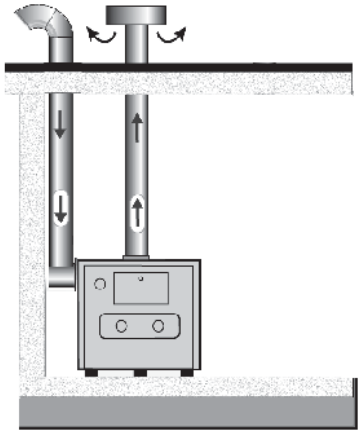
For larger applications, Genesis water heaters can be commonly vented together either in a tapered manifold or constant size manifold. (Follow National Fuel Gas Code requirements for sizing and installation.)

MULTI-VENTING CONFIGURATIONS

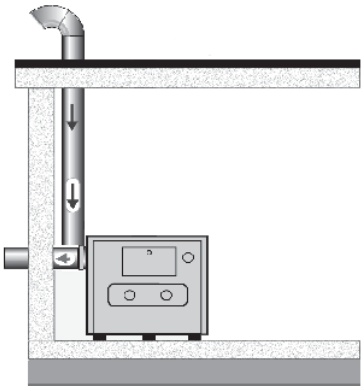
GENESIS 1000-2500 MODELS



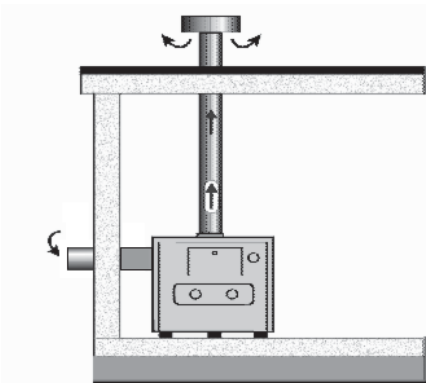
Horizontal Sidewall Direct Venting Rear Intake/Exhaust



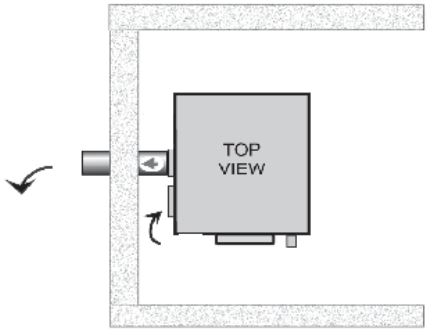
Vertical Direct Venting Top Exhaust



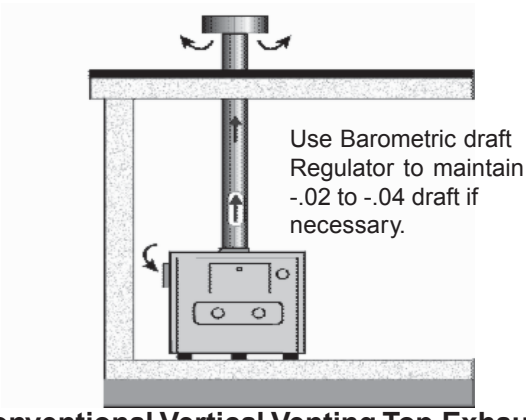
Horizontal Venting With Vertical Combustion Air Intake Top Intake/Rear Exhaust



Horizontal Venting With Horizontal Combustion Air Intake Rear Intake/Top Exhaust



Horizontal Sidewall Venting Rear Exhaust



Conventional Vertical Venting Top Exhaust

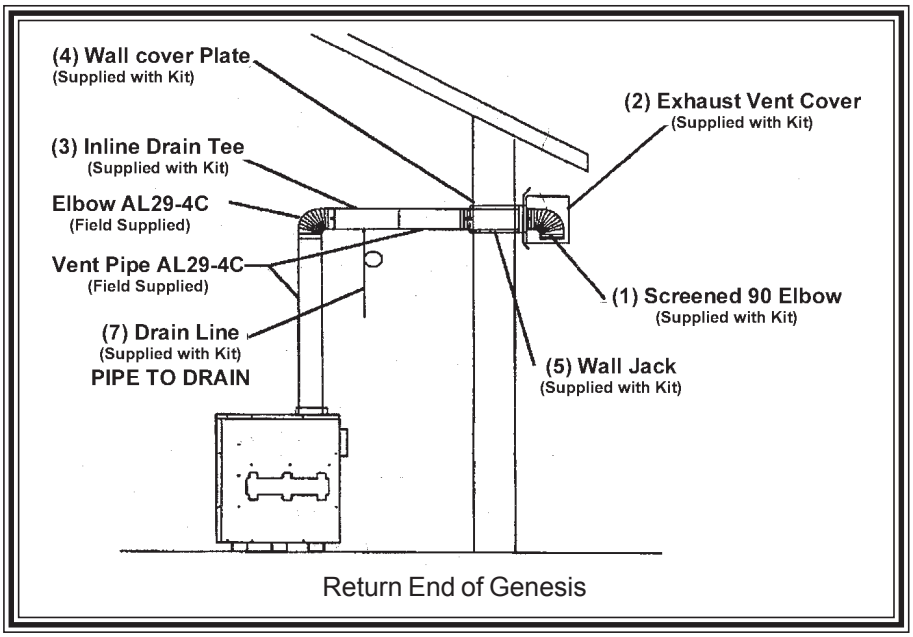
Venting Options for The Genesis:

- May be vented from the top or rear of the unit.
- May be vented vertically or horizontally.
- May use room air or be direct vented. (Air intake is on rear of cabinet only.)
- Vertical vent, non-direct is Category I. May be common vented - Barometric Draft Control required.
- Horizontal vent and direct vent are Category III. May NOT be common vented with other appliances.

GENESIS II VENTING

GENESIS 1000-2500 MODELS

The Genesis boiler may be individually vented vertically up to 35 feet without a barometric damper. Individual vents with an overall height of more than 35 feet require a barometric. Properly sized vent material and the use of a barometric damper (when required) will lead to proper vent operation. A barometric damper is required when draft exceeds -0.04 inches water column. When installed and adjusted properly, a **barometric damper** will maintain draft between -**0.02" and -0.04**" W.C... ensuring proper operation. Recommend to use "Fan Assisted" tables in NFGC to size vent - Category I.

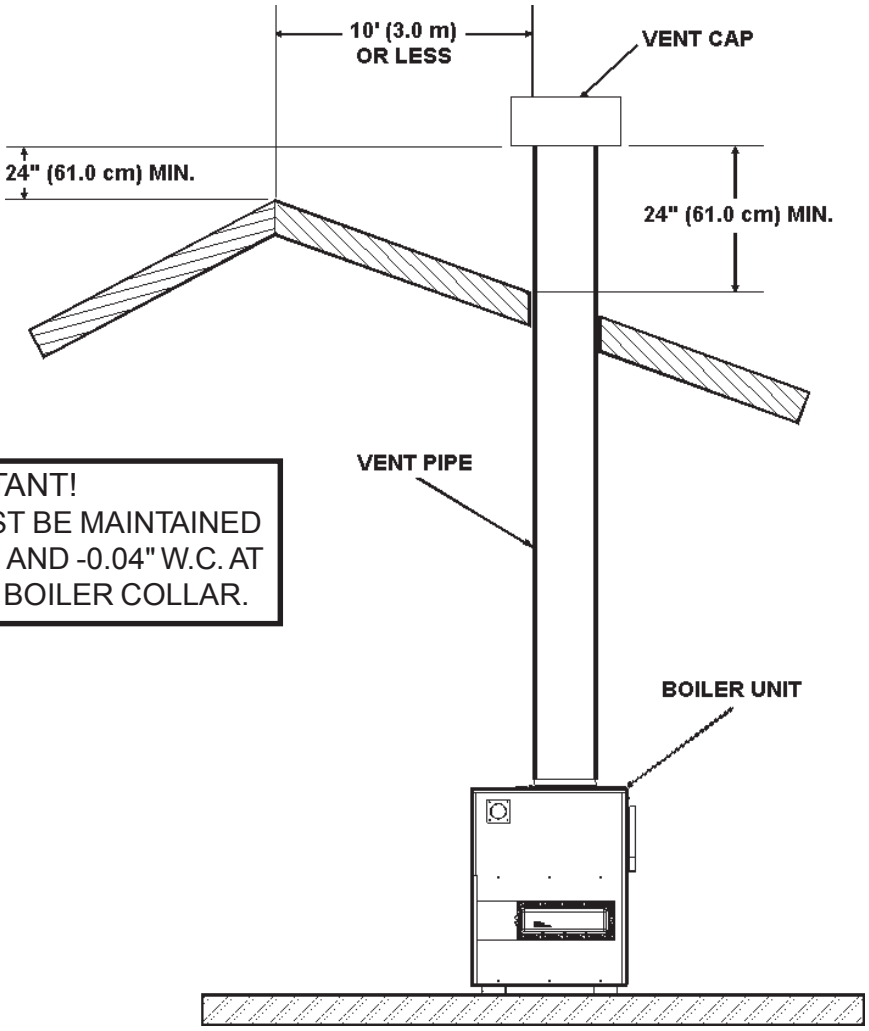


Return End of Genesis

Horizontal Venting Information Table			
	Vent size		Room Air Intake + Single Exhaust Vent Pipe Max. Equivalent Feet
Model Heater	Inches	mm	
GW/B-1000	10	254	70
GW/B-1300	12	305	70
GW/B-1500	12	305	70
GW/B-1850	14	355	40
GW/B-2100	14	355	40
GW/B-2500	16	406	40

Kits contain AL-29-4C vent material.
A 90° elbow = 10 equivalent feet of pipe; a 45° elbow = 5 equivalent feet.

STANDARD VENT - VERTICAL (CATEGORY I)



IMPORTANT!
VENT PRESURE MUST BE MAINTAINED BETWEEN -0.02" W.C. AND -0.04" W.C. AT 24" (61.0 cm) ABOVE BOILER COLLAR.

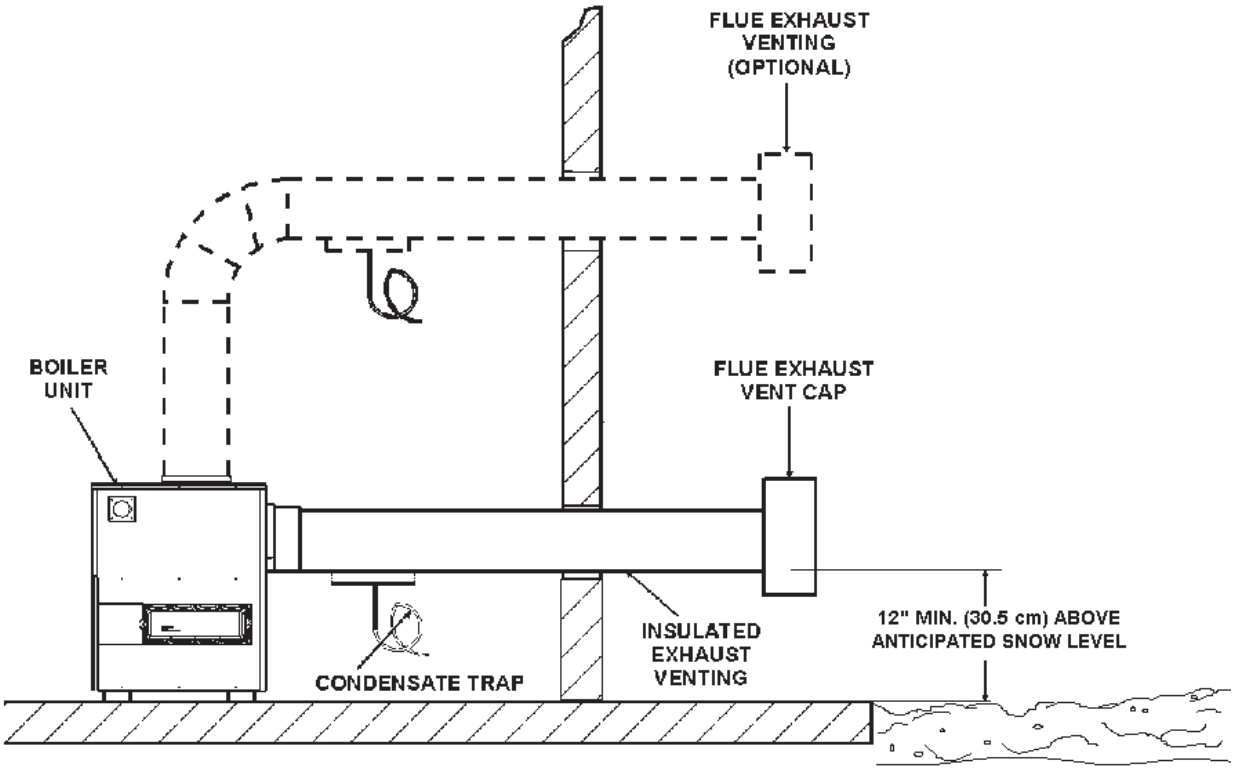
STANDARD VERTICAL VENTING (CATEGORY I)

MODEL	APPLIANCE CATEGORY	CERTIFIED VENTING MATERIAL	EXHAUST VENT SIZE (INCHES)	MAXIMUM LENGTH WITHOUT BAROMETRIC DAMPER (FEET)
I000	I	TYPE B OR EQUIVALENT	10"(25.4 cm)	35 Feet (10.7 m) without damper *70 Feet (21.3 m) max. with damper
1300 1500	I	TYPE B OR EQUIVALENT	12" (30.5 cm)	35 Feet (10.7 m) without damper *70 Feet (21.3 m) max. with damper
1850 2100	I	TYPE B OR EQUIVALENT	14"(35.6 cm)	35 Feet (10.7 m) without damper *70 Feet (21.3 m) max. with damper
2500	I	TYPE B OR EQUIVALENT	16" (40.6 cm)	35 Feet (10.7 m) without damper *70 Feet (21.3 m) max. with damper

*** Extending venting over 70 feet (21.3 m) may require special considerations. A 90 elbow = 10 equivalent feet of pipe; a 45° = 5 feet.**

• Connection for the appliance exhaust vent to the stack must be as direct as possible. Maximum and minimum venting length for Category I appliances shall be determined per the latest edition of the National Fuel Code (U.S.) and CAN/CSA-B149.1 and .2 Installation Code (Canada).

STANDARD VENT - HORIZONTAL (CATEGORY III)

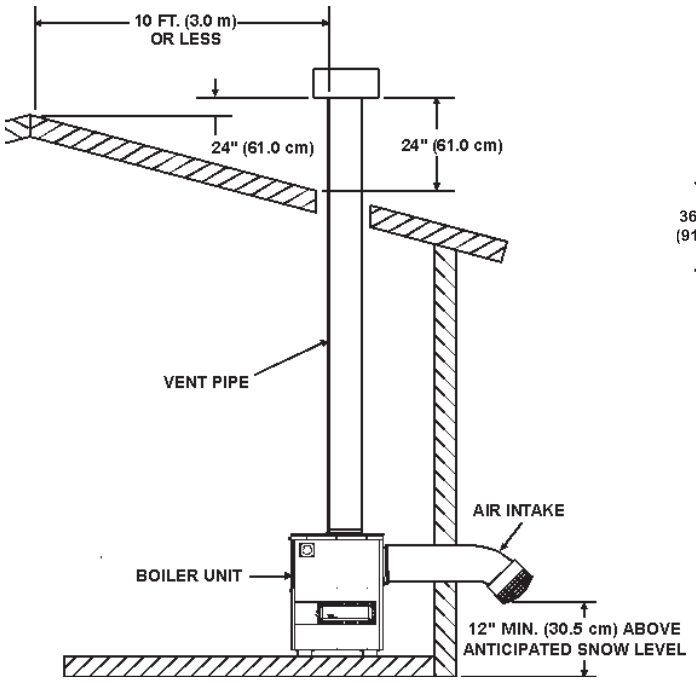


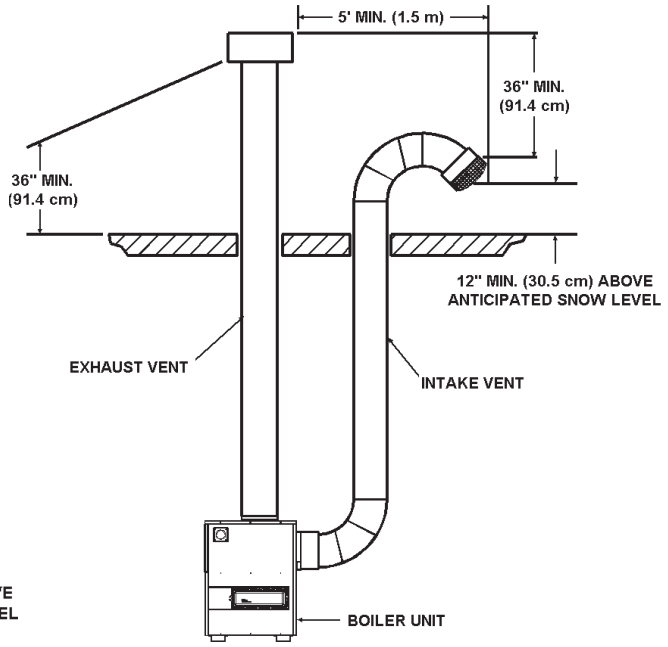
MODEL	APPLIANCE CATEGORY	CERTIFIED VENTING MATERIAL	EXHAUST VENT SIZE (INCHES)	MAXIMUM VENT LENGTH (FEET)
I000	III	STAINLESS STEEL AL 29-4C	10"(25.4 cm)	70' (21.3 m)
1300 1500	III	STAINLESS STEEL AL 29-4C	12" (30.5 cm)	70' (21.3 m)
1850 2100	III	STAINLESS STEEL AL 29-4C	14"(35.6 cm)	40' (21.3 m)
2500	III	STAINLESS STEEL AL 29-4C	16" (40.6 cm)	40' (21.3 m)

WARNING: No substitutions of flue pipe or vent cap material are allowed. Such substitutions would jeopardize the safety and health of inhabitants.

• A maximum of two elbows can be used on inlet and outlet vent piping respectively. Each 90° elbow is equal to 10 feet (3 M) of straight pipe.

DIRECT VENT - VERTICAL (CATEGORY I)



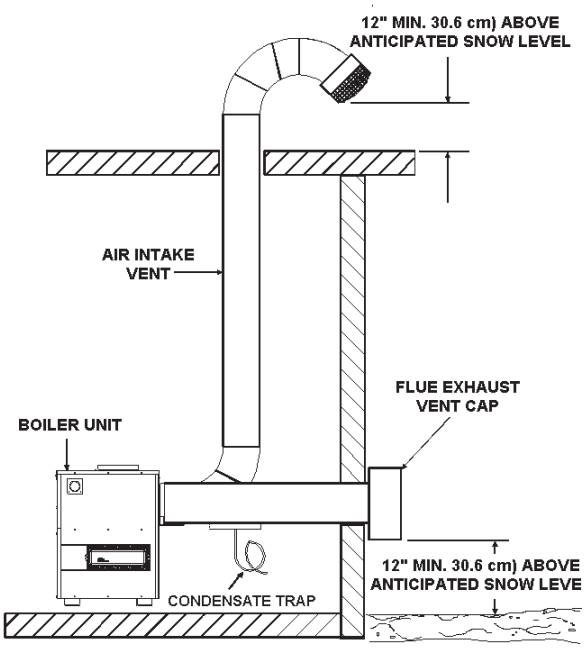


DIRECT VENT (VERTICAL EXHAUST CONFIGURATIONS)

MODEL	APPLIANCE CATEGORY	CERTIFIED EXHAUST VENT MATERIAL	EXHAUST VENT SIZE (IN)	MAXIMUM EXHAUST VENT LENGTH (FT)	AIR INTAKE MATERIAL	AIR INLET SIZE (IN)	MAXIMUM AIR INTAKE LENGTH (FT)
I000	I	TYPE B OR EQUIVALENT	10" (25.4 cm)	35' (10.7 m)	GAL. STEEL PVC, ABS OR CPVC	8" (20.3 cm)	35' (10.7 m)
1300 1500	I	TYPE B OR EQUIVALENT	12" (30.5 cm)	35' (10.7 m)	GAL.STEEL PVC, ABS CR CPVC	10" (25.4 cm)	35' (10.7 m)
1850	I	TYPE B OR EQUIVALENT	14" (35.6 cm)	20' (6.1 m)	GAL. STEEL PVC, ABS OR CPVC	10" (25.4 cm)	20' (6.1 m)
2100	I	TYPE B OR EQUIVALENT	14" (35.6 cm)	20' (6.1 m)	GAL. STEEL PVC, ABS OR CPVC	12" (30.5 cm)	20' (6.1 m)
2500	I	TYPE B OR EQUIVALENT	16" (40.6 cm)	20' (6.1 m)	GAL. STEEL PVC, ABS OR CPVC	12" (30.5 cm)	20' (6.1 m)

• The vent should be installed so as to prevent the accumulation of condensate and, where necessary, have means provided for drainage of condensate. The horizontal breaching of a vent must have an upward slope of not less than 1/4 inch per linear foot (2 cm/m) from the boiler to the vent terminal. The horizontal portion of the vent shall be supported to maintain clearances and to prevent physical damage or separation of joints.

DIRECT VENT - HORIZONTAL (CATEGORY III)



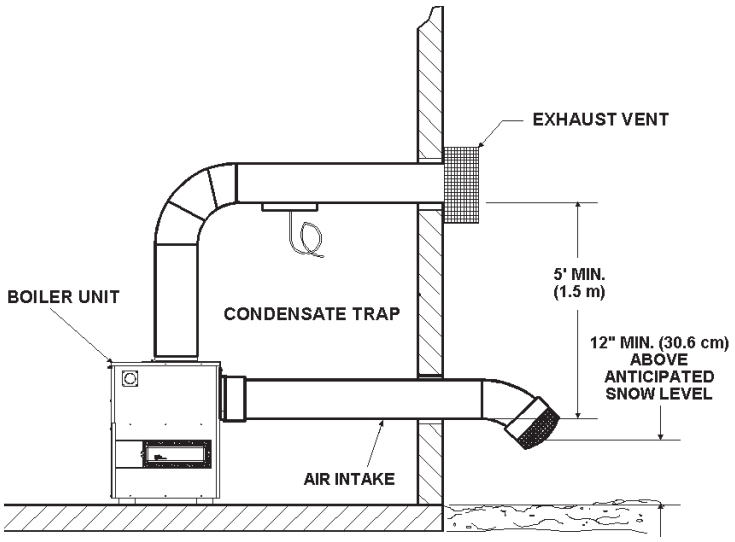


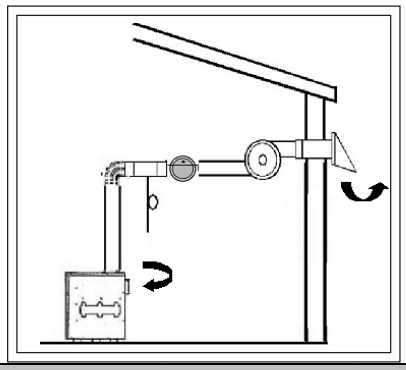
TABLE 10. DIRECT VENT (HORIZONTAL EXHAUST CONFIGURATIONS)

MODEL	APPLIANCE CATEGORY	CERTIFIED EXHAUST VENT MATERIAL	VENT SIZE (INCHES)	MAXIMUM VENT LENGTH (FEET)	AIR INTAKE MATERIAL	AIR INLET SIZE (INCHES)	MAXIMUM AIR INTAKE LENGTH (FEET)
I000	III	AL29-4C STAINLESS (SEALED)	10" (25.4 cm)	35' (10.7 m)	GAL. STEEL PVC, ABS OR CPVC	8" (20.3 cm)	35' (10.7 m)
1300 1500	III	AL29-4C STAINLESS (SEALED)	12" (30.5 cm)	35' (10.7 m)	GAL.STEEL PVC, ABS CR CPVC	10" (25.4 cm)	35' (10.7 m)
1850	III	AL29-4C STAINLESS (SEALED)	14" (35.6 cm)	20' (6.1 m)	GAL. STEEL PVC, ABS OR CPVC	10" (25.4 cm)	20' (6.1 m)
2100	III	AL29-4C STAINLESS (SEALED)	14" (35.6 cm)	20' (6.1 m)	GAL. STEEL PVC, ABS OR CPVC	12" (30.5 cm)	20' (6.1 m)
2500	III	AL29-4C STAINLESS (SEALED)	16" (40.6 cm)	20' (6.1 m)	GAL. STEEL PVC, ABS OR CPVC	12" (30.5 cm)	20' (6.1 m)

WARNING: No substitutions of flue pipe or vent cap material are allowed. Such substitutions would jeopardize the safety and health of inhabitants.

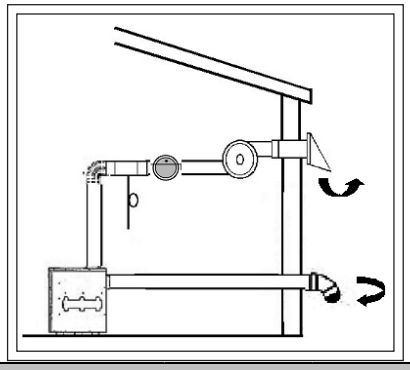
• A maximum of two elbows can be used on inlet and outlet vent piping respectively. Each elbow is equal to 10 feet (3 m) of straight pipe.

EXTENDED SIDEWALL VENTING (POWER ASSIST)



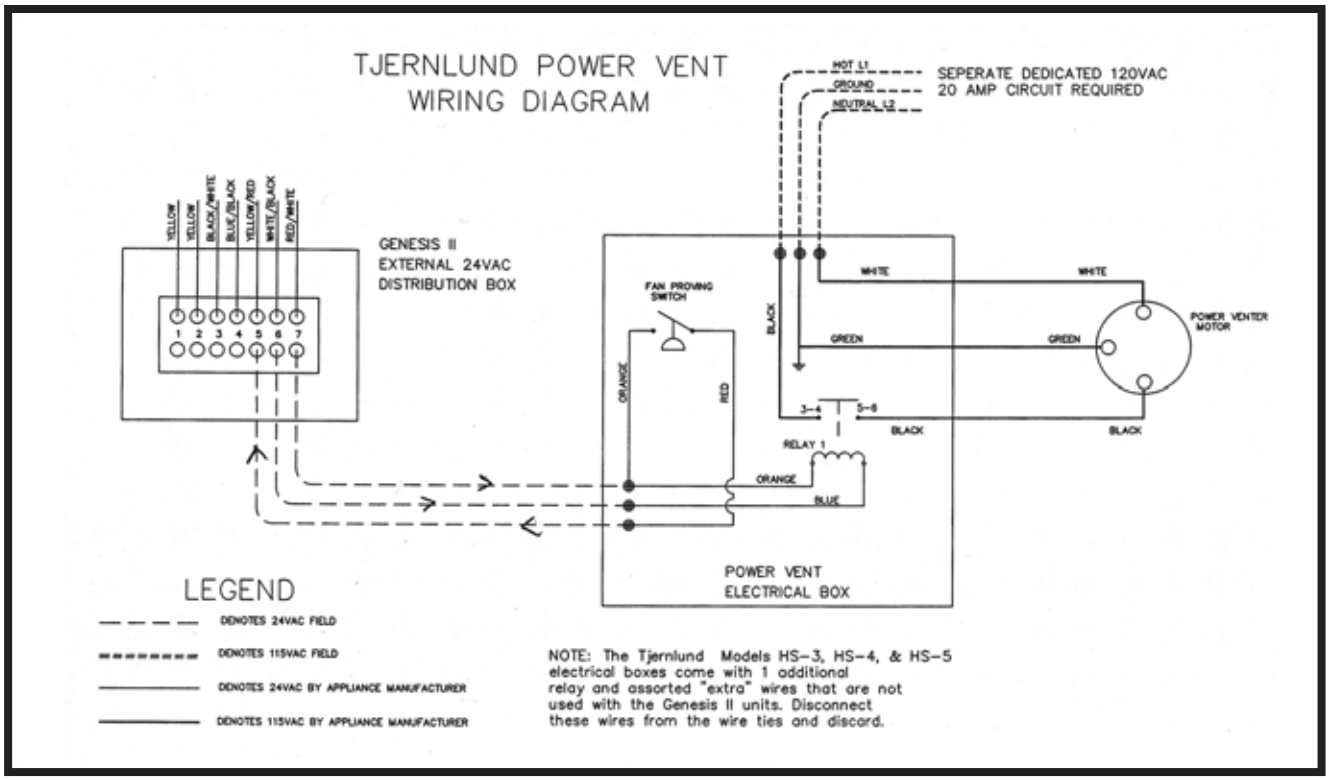
Extended Horizontal Sidewall Venting					
Model #	**Vent Outlet Size (Inch)**	**Vent Pipe Size (Inch)**	**Max. Equivalent Feet of Vent Piping**	**Certified Venting Category**	**Approved Venting Material**
GB/GW-1000	10	10	110	Category III	AL29-4C Stainless Steel (Gas Tight)
GB/GW-1300, 1500	12	8	100	Category III	AL29-4C Stainless Steel (Gas Tight)
GB/GW-1850	14	10	100	Category III	AL29-4C Stainless Steel (Gas Tight)
GB/GW-2100	14	10	100	Category III	AL29-4C Stainless Steel (Gas Tight)
GB/GW-2500	16	10	100	Category III	AL29-4C Stainless Steel (Gas Tight)

EXTENDED SIDEWALL VENTING (POWER ASSIST)



Extended Horizontal Direct Venting							
Model #	**Vent Outlet Size (Inch)**	**Vent Pipe Size (Inch)**	**Max. Equivalent Feet of Vent/Combustion Air Piping**	**Certified Venting Category**	**Approved Venting Material**	**Combustion Air Inlet Pipe Size (Inch)**	**Approved Combustion Air Inlet Material**
GB/GW-1000	10	10	60'/60'	Category III	AL29-4C Stainless Steel (Gas Tight)	8	Galvanized Steel, PVC, ABS, CPVC
GB/GW-1300, 1500	12	8	60'/60'	Category III	AL29-4C Stainless Steel (Gas Tight)	10	Galvanized Steel, PVC, ABS, CPVC
GB/GW-1850	14	10	60'/60'	Category III	AL29-4C Stainless Steel (Gas Tight)	10	Galvanized Steel, PVC, ABS, CPVC
GB/GW-2100	14	10	60'/60'	Category III	AL29-4C Stainless Steel (Gas Tight)	12	Galvanized Steel, PVC, ABS, CPVC
GB/GW-2500	16	10	60'/60'	Category III	AL29-4C Stainless Steel (Gas Tight)	12	Galvanized Steel, PVC, ABS, CPVC

GENESIS POWER VENT WIRING DIAGRAM

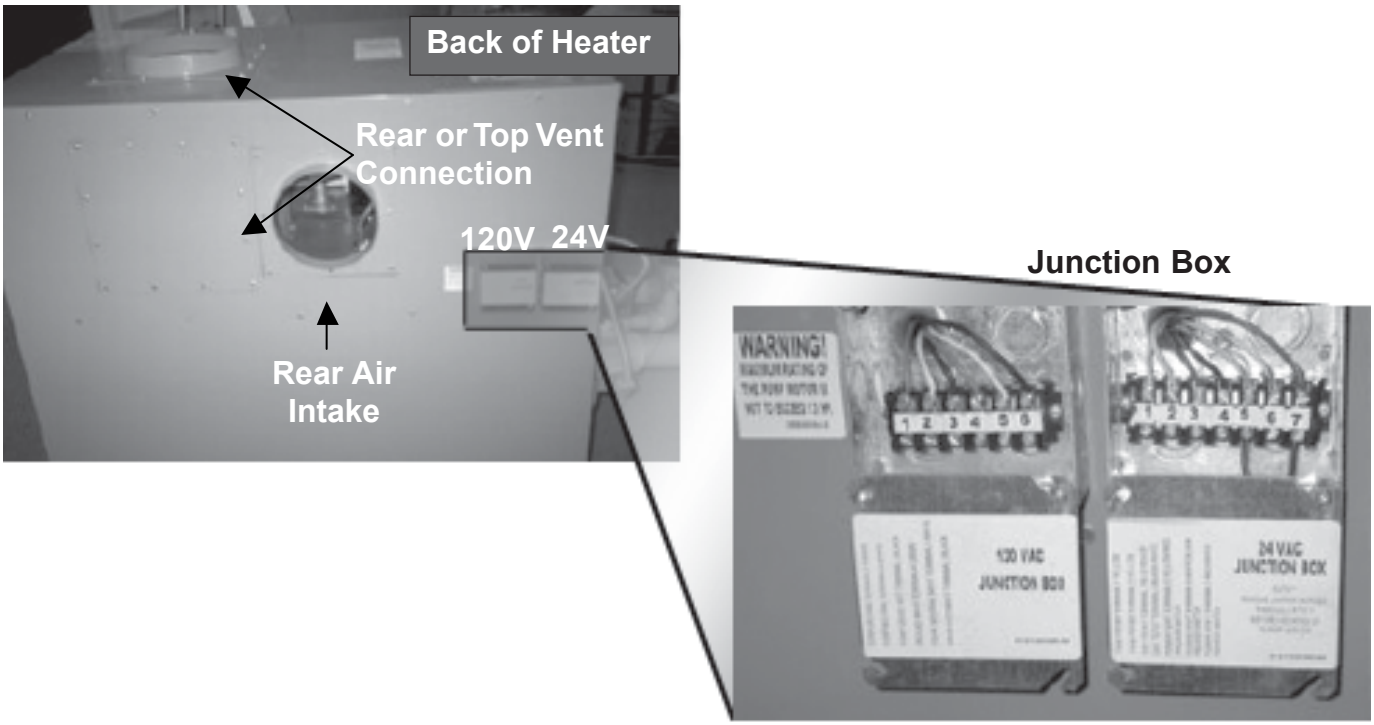


Electrical power to the power venter must be supplied by the installer and wired according to the Wiring Diagram. Wiring must comply with the wiring diagram in order for the boiler to function properly. The wiring is part of the boiler's safety circuit and shuts off the boiler if the Fan Proving Switch at the power venter is not made.

The Genesis II Control System is also set to shut off the power venter when there is no "call for heat". A normal condition for the boiler's Display Board is for the Power Venter Red LED to remain lit while the unit is in a Standby mode. Awaiting another "call for heat". Once a "call for heat" is generated, the Control System will start a Firing sequence by starting all of the blowers inside the unit and at the same time send a 24 VAC signal and a 24 VAC return (terminals 7 & 6 of the Genesis II External 24 VAC Distribution Box) to the power venter to turn its fan motor on utilizing relay R1 at the Power Venter Electrical Box. Once the Power Venter fan gets up to speed and makes the fan proving switch, the 24 VAC signal is routed back to the boiler and can be measured between terminals 5 and 6 at the Genesis II External 24 VAC Distribution Box. The returning 24 VAC signal will then extinguish the previously lit Red LED and the unit will continue its Normal Pre-purge mode and then light the boiler.

Any failure will shutoff the boiler and the power venter off after the Post-purge Cycle is completed. The failure that caused the shut down will be displayed at the Display Board and a Lockout message and error code will be displayed. Remember that when the Power venter is not running, the Red LED indicator for the Power Venter will also be displayed; so troubleshoot the other indicators first before suspecting the Power Venter. If the cause of the failure is the Power Venter, then the only Red LED lit will be its own and the Display Message will be "Lock-Out 070" ---the error code for a Power Venter Failure.

LOCATION OF PARTS



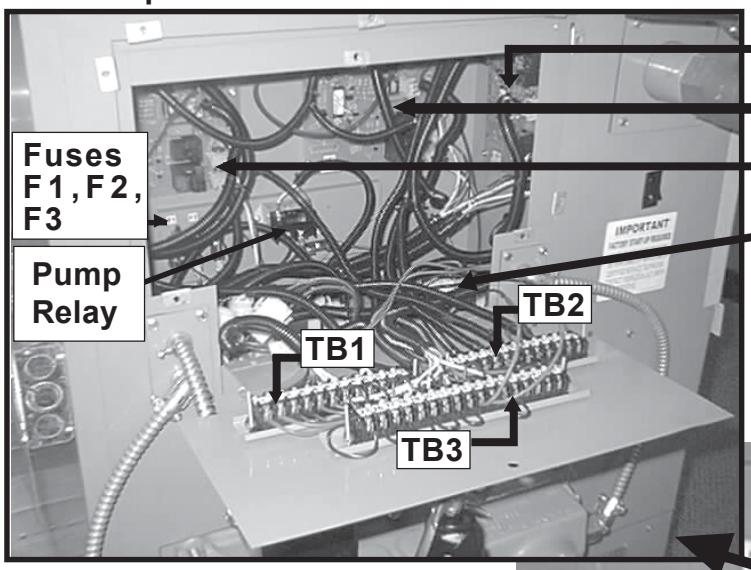
PUMP GROUND TERMINAL 1 GREEN
PUMP NEUTRAL TERMINAL 2 WHITE
PUMP 120VAC HOT TERMINAL 3 BLACK
GROUND INPUT TERMINAL 4 GREEN
120VAC NEUTRAL INPUT TERMINAL 5 WHITE
120VAC HOT INPUT TERMINAL 6 BLACK
120 VAC JUNCTION BOX
TANK PROBE TERMINAL 1 YELLOW
TANK PROBE TERMINAL 2 YELLOW
EXT. TSTAT TERMINAL 3 BLUE/BLACK
EXT. TSTAT TERMINAL 4 BLACK/WHITE
POWER VENT TERMINAL 5 YELLOW/RED
PROVER SWITCH
POWER VENT TERMINAL 6 WHITE/BLACK
PROVER SWITCH
POWER VENT TERMINAL 7 RED/WHITE
PROVER SWITCH
24 VAC JUNCTION BOX

Pump Ground Terminal 1 Green
Pump Neutral Terminal 2 White
Pump 120VAC Hot Terminal 3 Black
Ground Input Terminal 4 Green
120VAC Neutral Input Terminal 5 White
120VAC Hot Input Terminal 6 Black

Tank Probe Terminal 1 Yellow
Tank Probe Terminal 2 Yellow
Ext. TSTAT Terminal 3 Blue Black
Ext. TSTAT Terminal 4 Black White
Power Vent Terminal 5 Yellow Red
Prover Switch
Power Vent Terminal 6 White Black
Prover Switch
Power Vent Terminal 7 Red White
Prover Switch

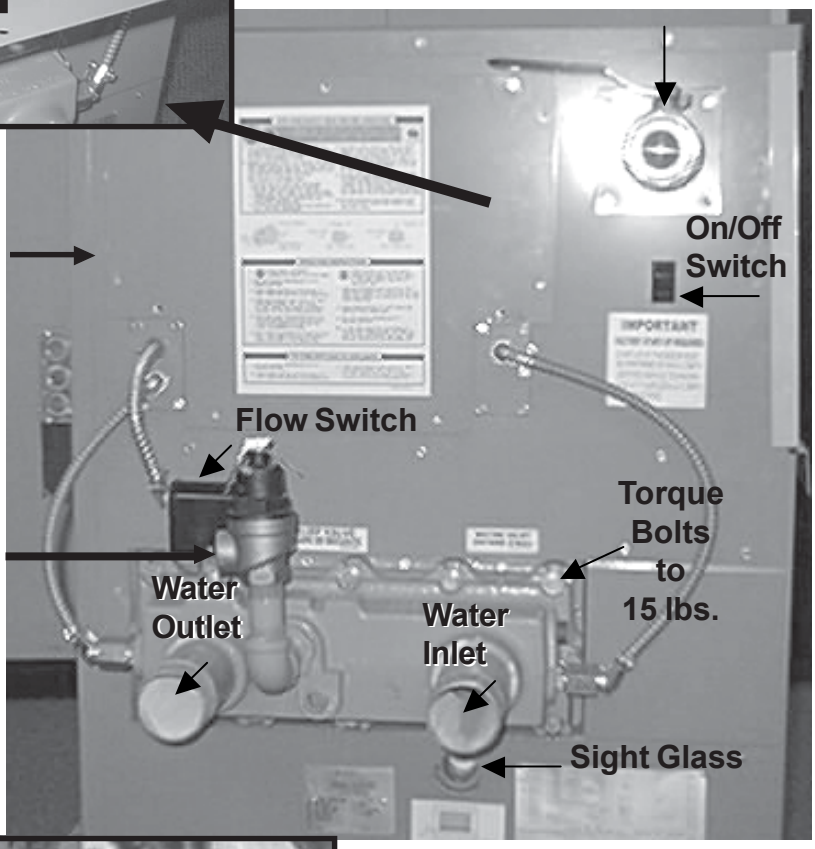
LOCATION OF PARTS

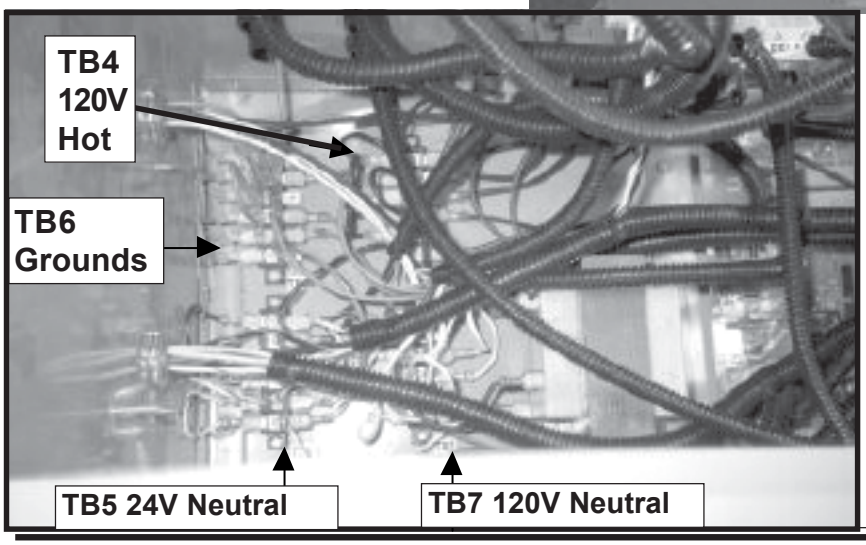
Open Electrical Access Door



Manual Gas Shutoff

Electrical Access Door

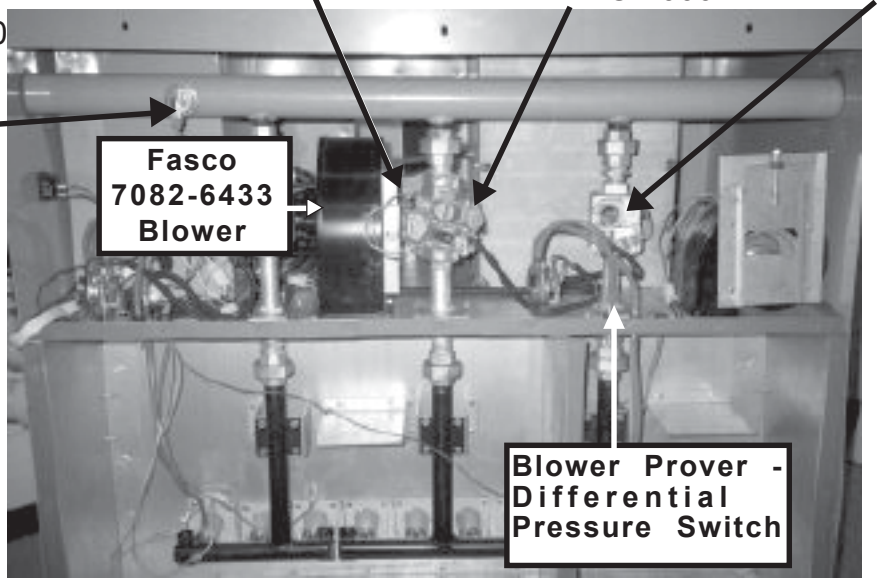


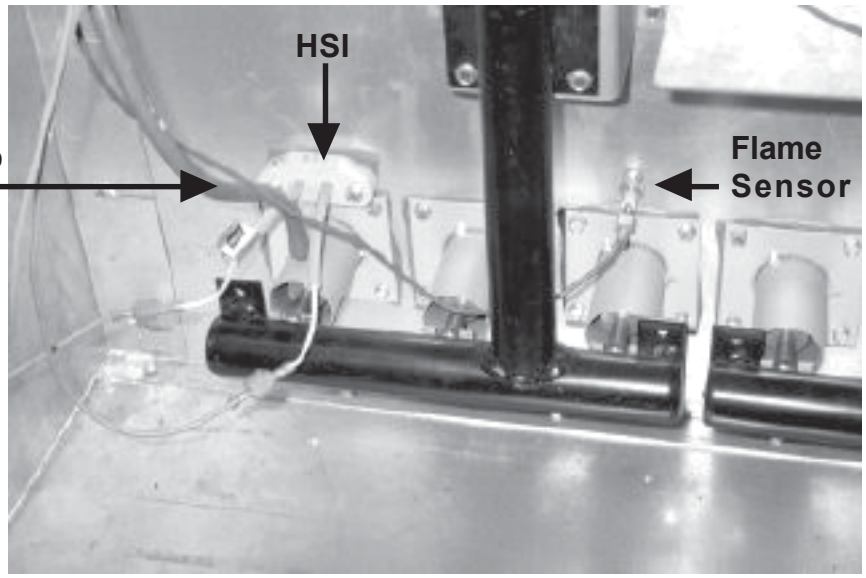


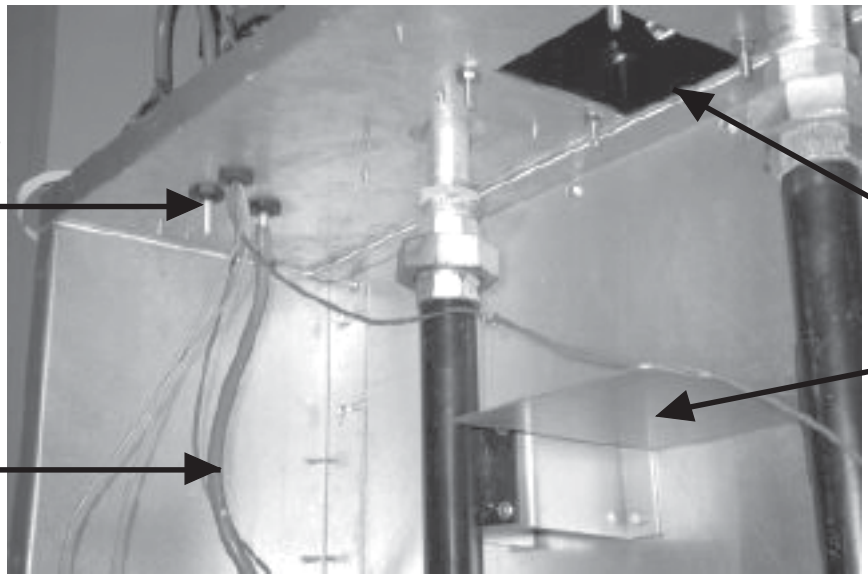
TB = TERMINAL BOARD
CCB = CENTRAL CONTROL BOARD
ICB = IGNITION CONTROL BOARD

Transformer
120-Top Terminal
24-Lower terminal

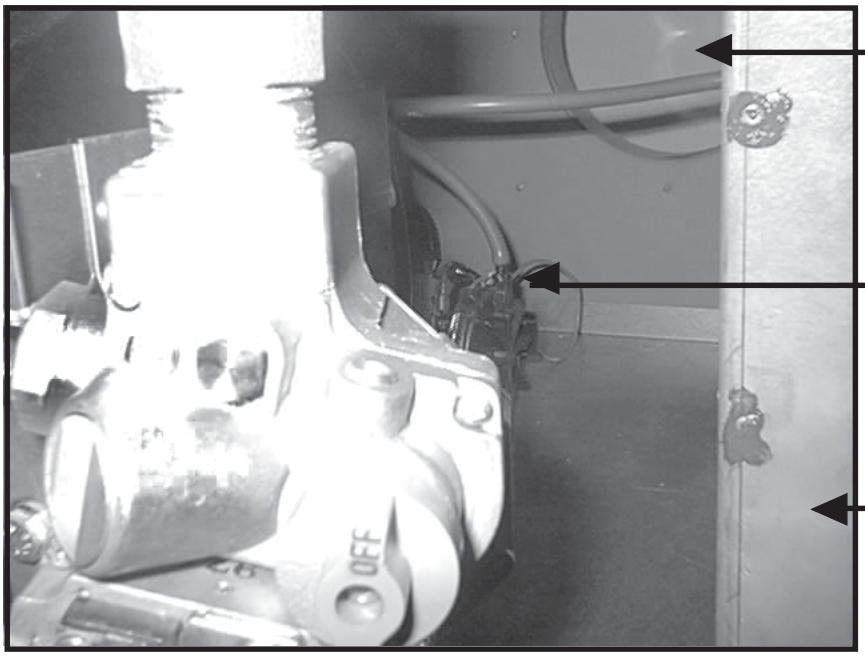
LOCATION OF PARTS

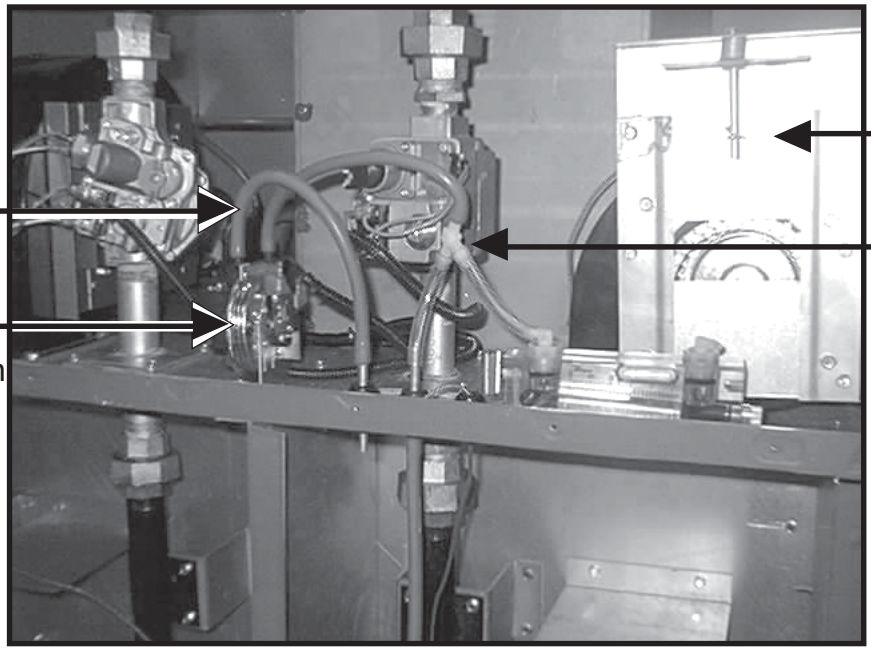

Set Air Shutter to 1.6"W.C.
Robert Shaw DERHC-7000
White Rogers 36c68
Low Gas Pressure Switch closes at 5.0 ± .4 " W.C. positive pressure
Fasco 7082-6433 Blower
Blower Prover - Differential Pressure Switch

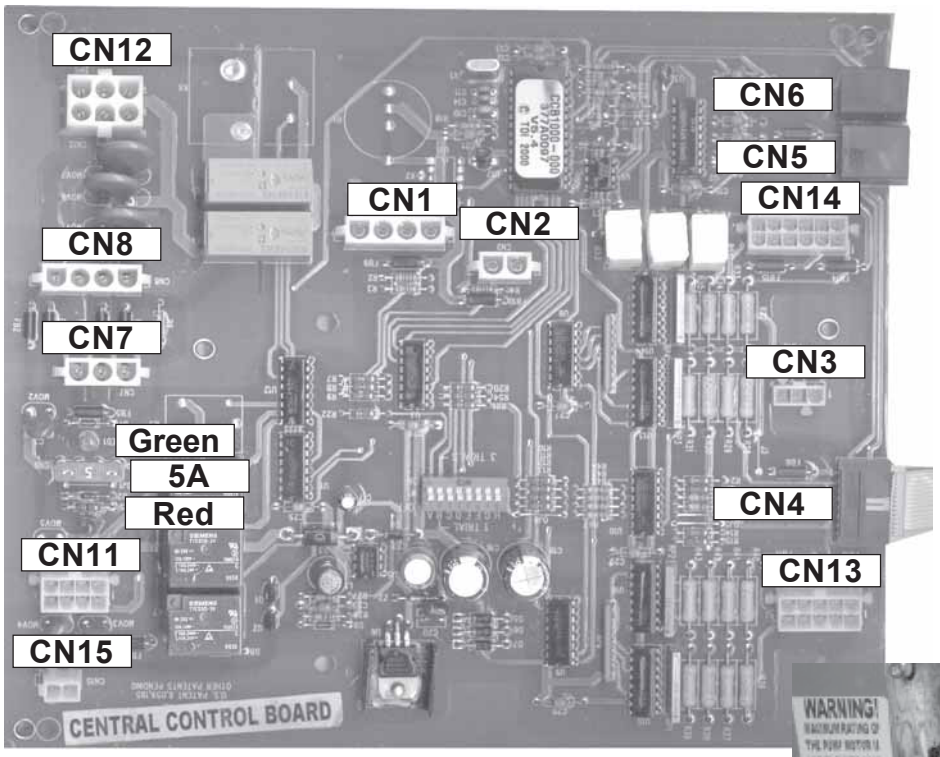



Blower Prover Connects to Front Port of Switch (positive pressure)
Blower Air
Rear Hose Connects to Rear Port of Switch and Main Burner (negative pressure)
Draft Diffuser Plate

LOCATION OF PARTS

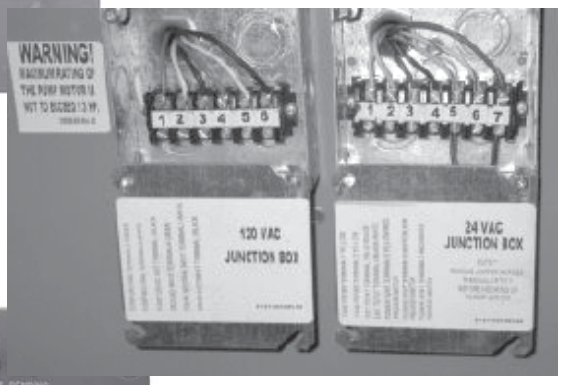


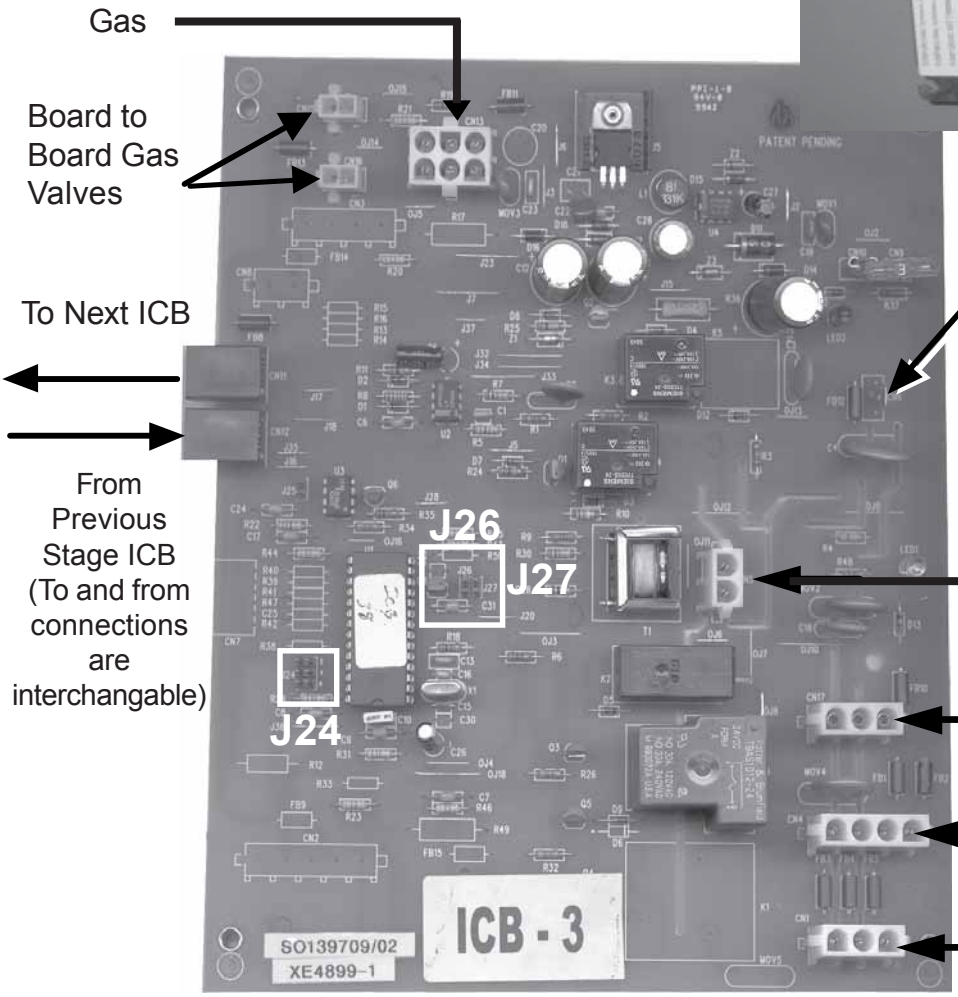




CENTRAL CONTROL BOARD (CCB)

JUNCTION BOX

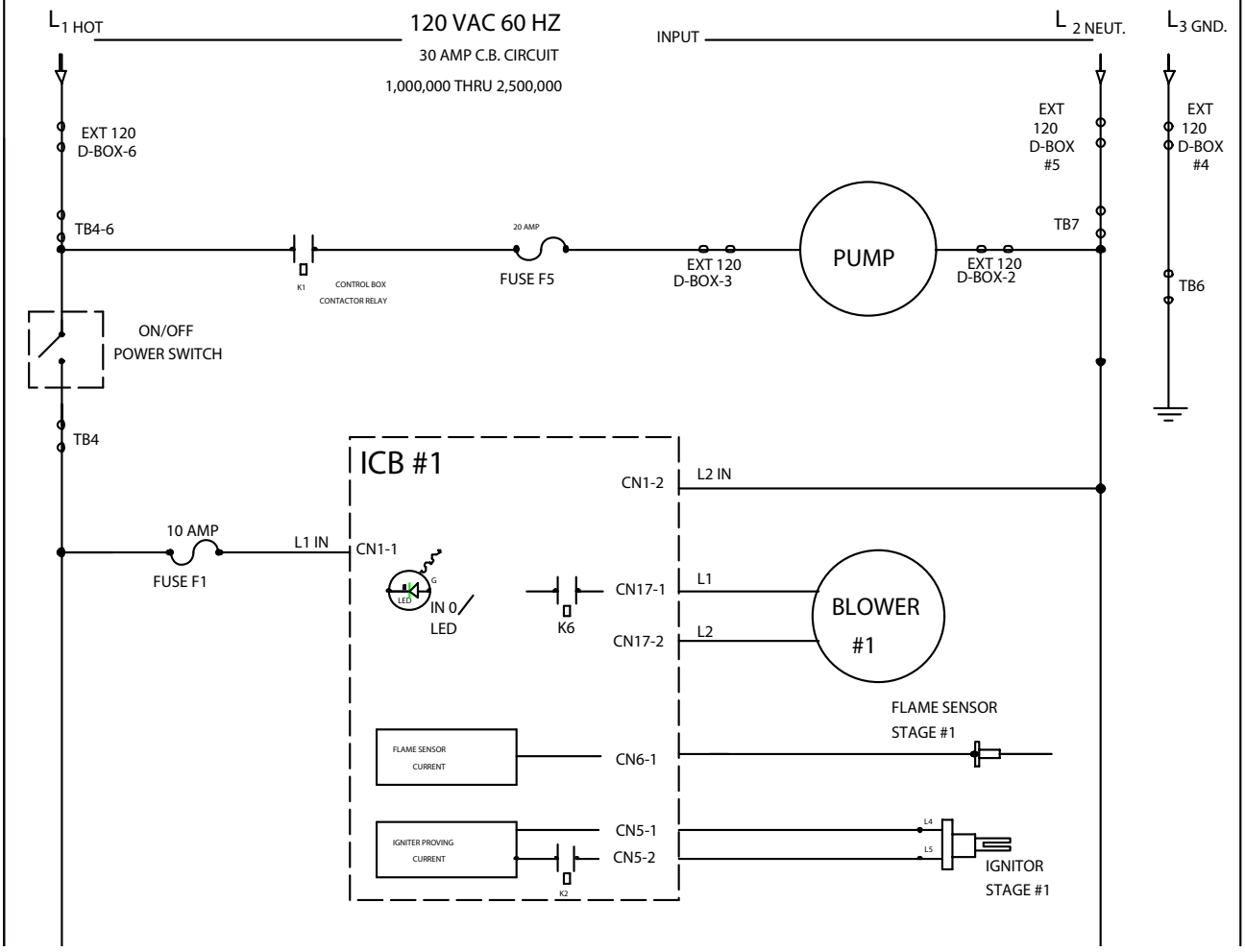




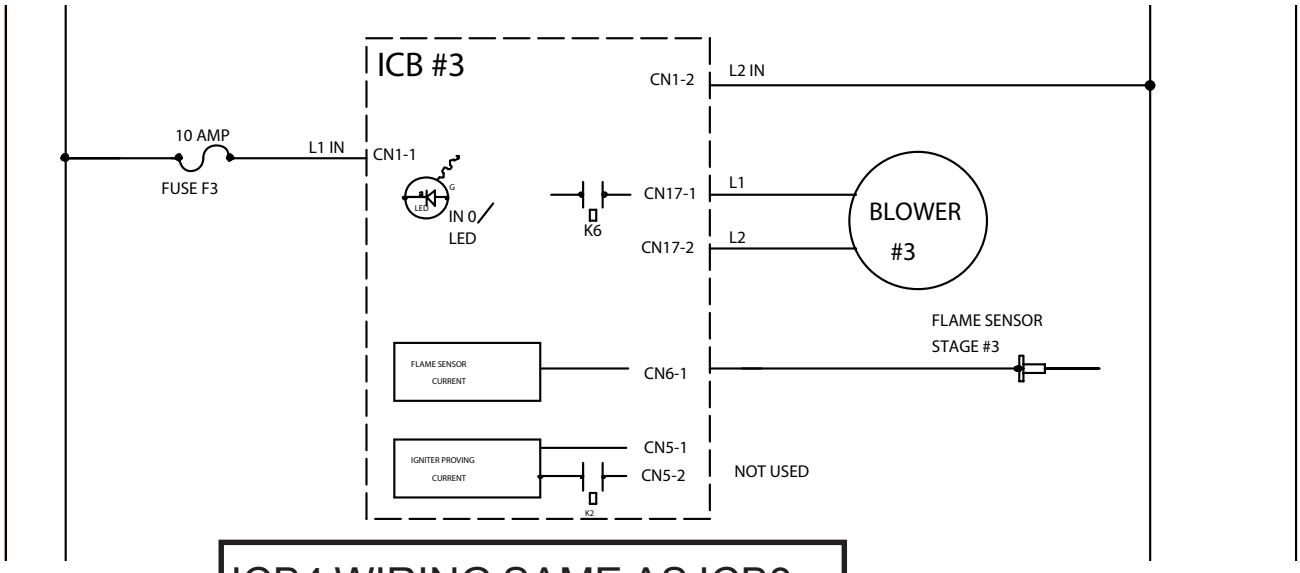
IGNITION CONTROL BOARD (ICB)

GENESIS WIRING DIAGRAM

ELECTRICAL CONNECTION DIAGRAM - 1 of 4

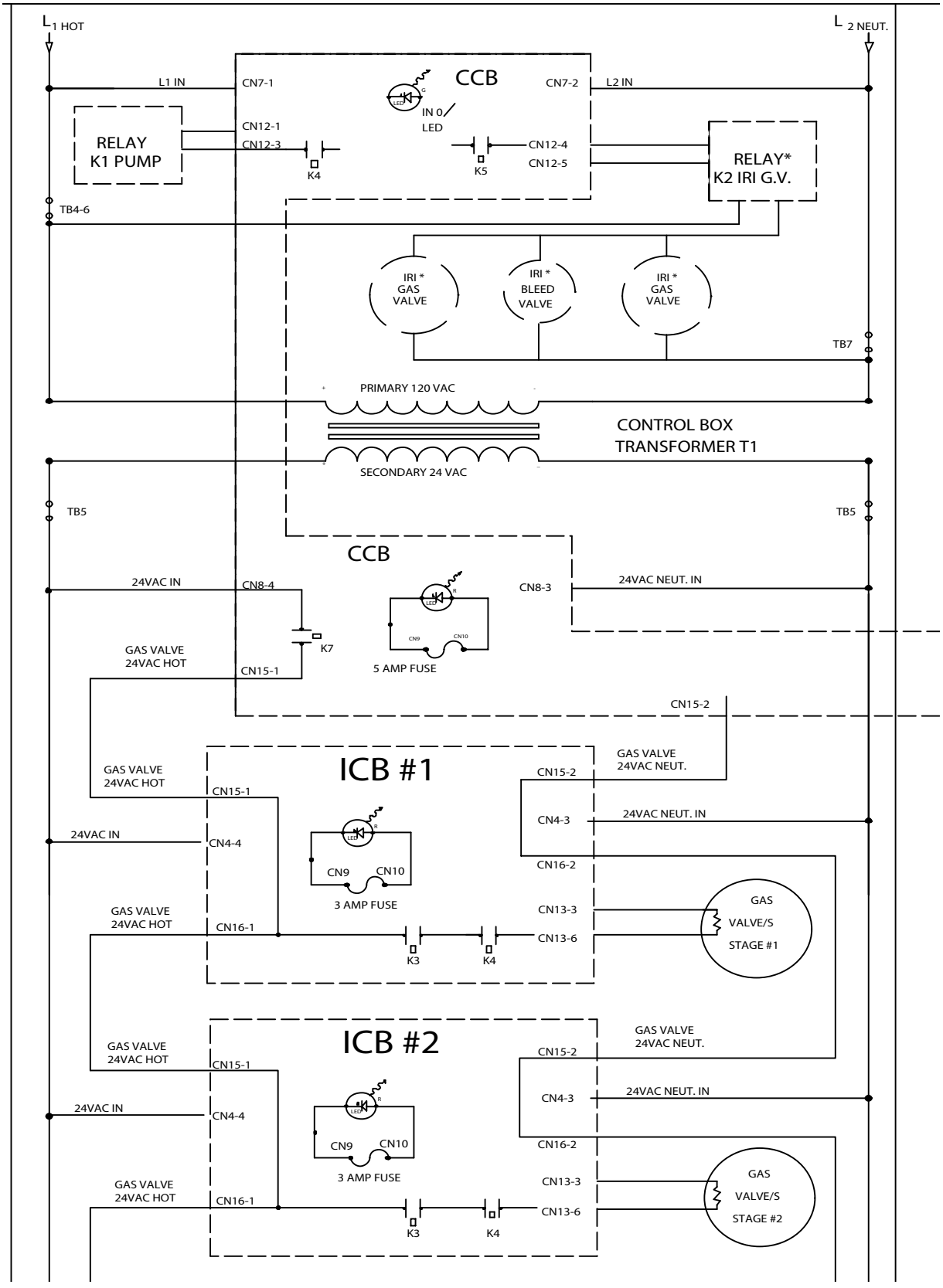


ICB2 WIRING SAME AS ICB1



ICB4 WIRING SAME AS ICB3

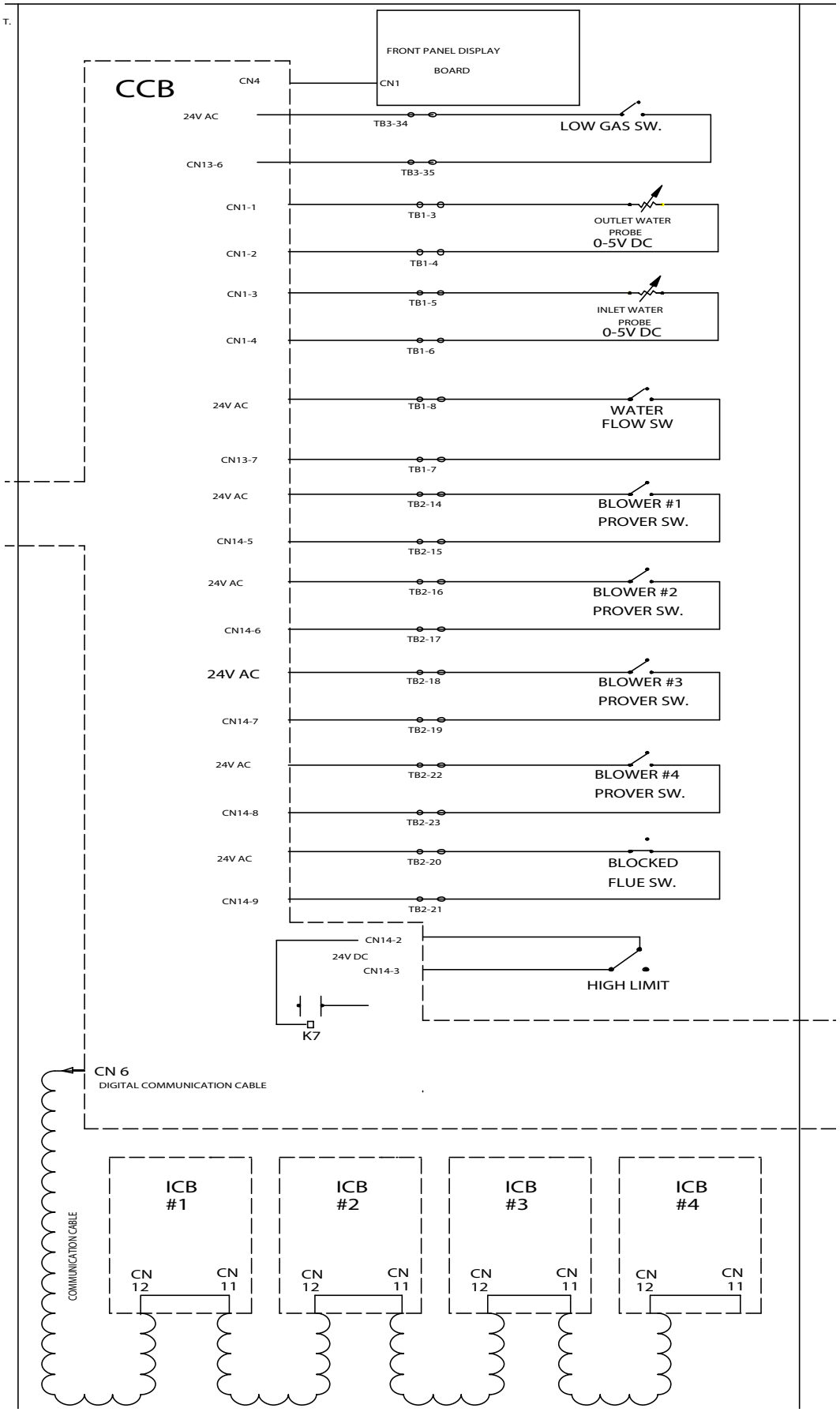
ELECTRICAL CONNECTION DIAGRAM - 2 of 4



CCB=Central Control Board
ICB=Ignition Control Board
ECO=Energy Cut Off
LWCO=Low Water Cut Off
IRI=Industrial Risk Insurance
CPU=Central Processing Unit
CSD1=Control Safety Devices - 1

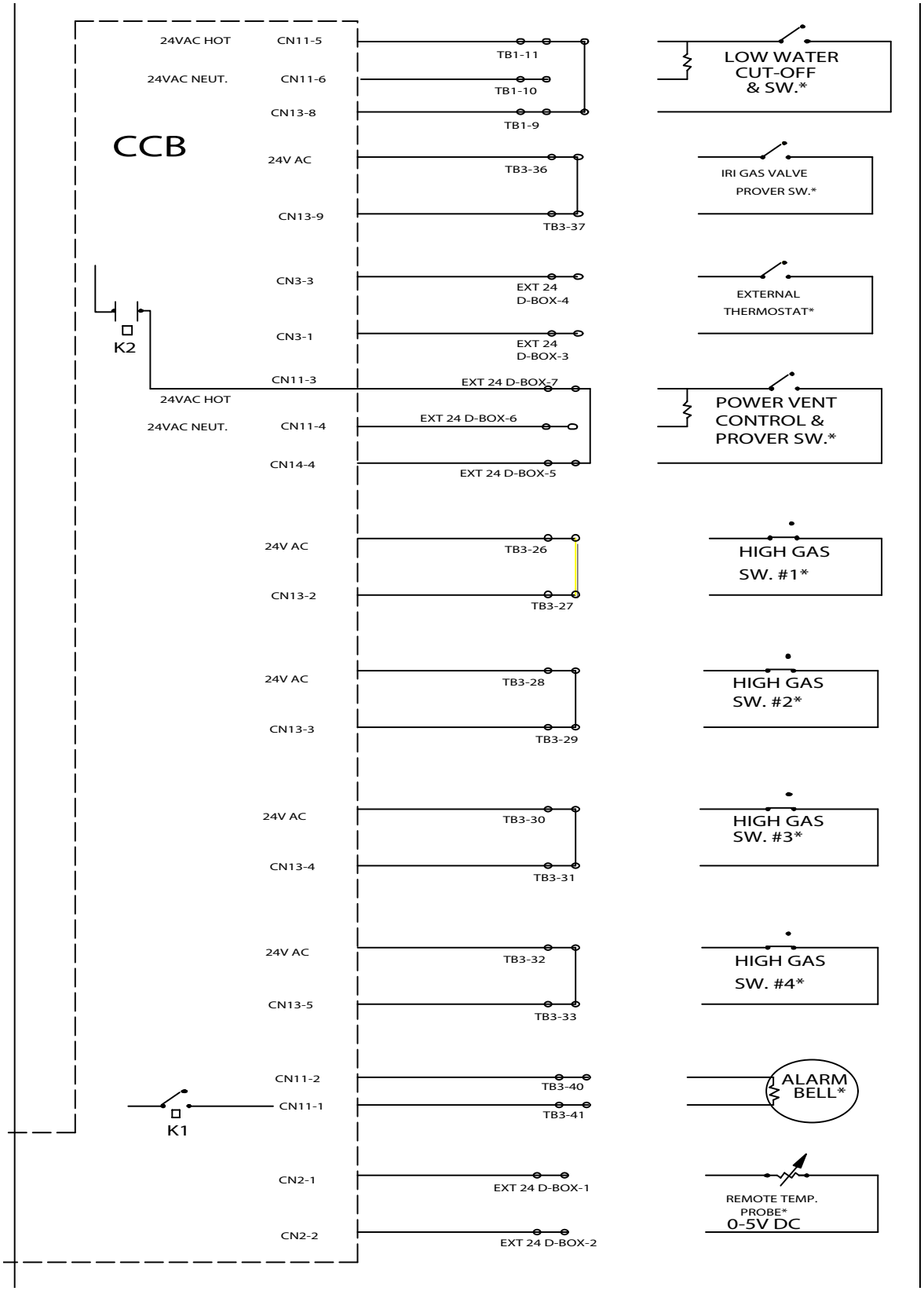
ICB3 AND ICB4 WIRING
SAME AS ICB1 AND ICB2

ELECTRICAL CONNECTION DIAGRAM - 3 of 4



COMMUNICATION CABLE

ELECTRICAL CONNECTION DIAGRAM - 4 of 4

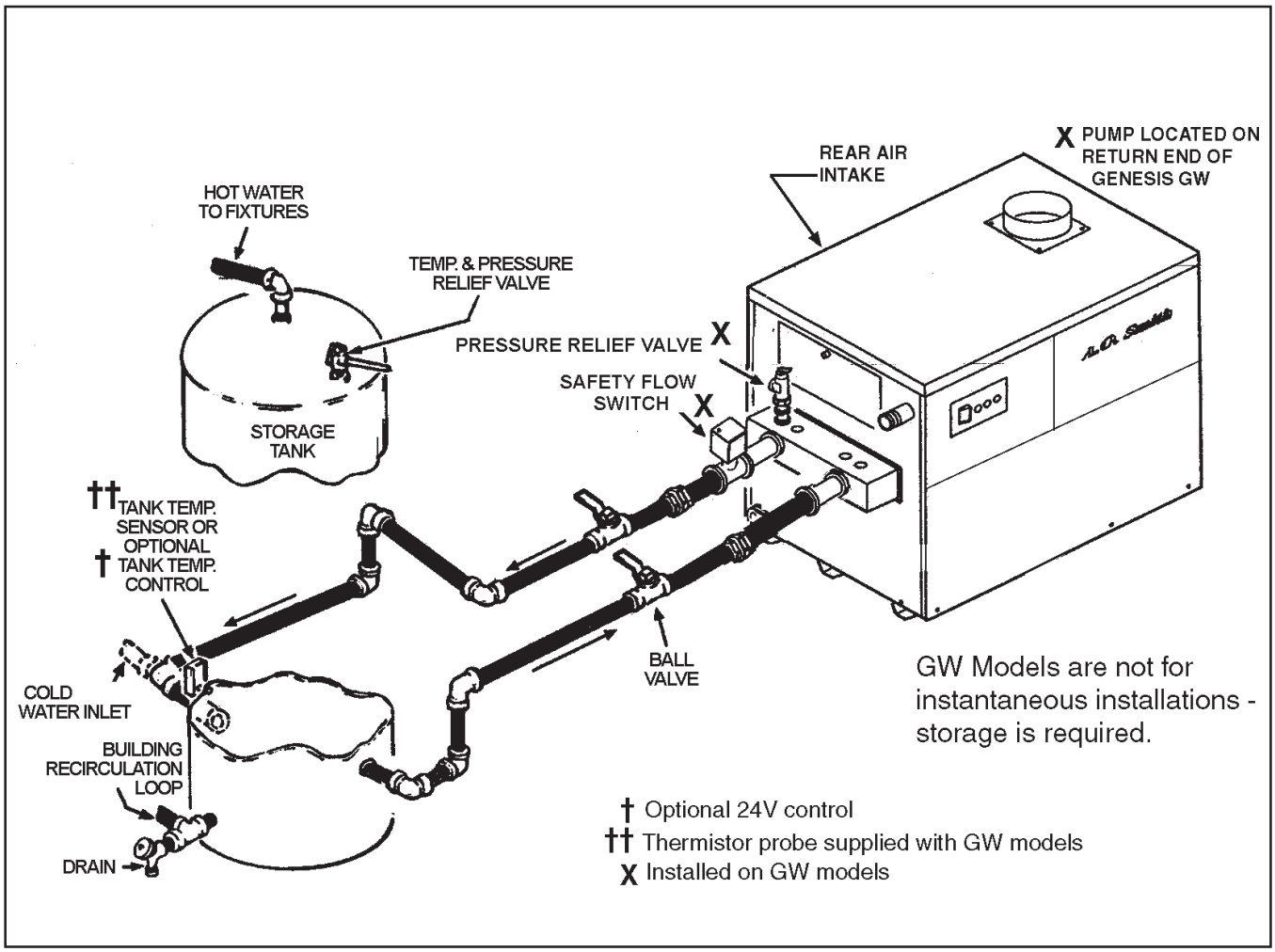


OPTIONAL INPUTS

1. THIS UNIT MAY HAVE ALL, SOME OR NONE OF THE ABOVE OPTIONS
2. FOR CORRECT NO. OF BLOWERS & BLOWER PROVER SWITCHES, PLEASE CONSULT THE WIRING DIAGRAM AS SUPPLIED WITH THE UNIT.

WATER PIPING

This manual will discuss using a Genesis GW (water heater) model installed for potable hot water. A separate manual will discuss installation of GB (Boiler) models for hydronic heating applications.


X PUMP LOCATED ON RETURN END OF GENESIS GW
REAR AIR INTAKE
HOT WATER TO FIXTURES
TEMP. & PRESSURE RELIEF VALVE
PRESSURE RELIEF VALVE X
SAFETY FLOW SWITCH X
STORAGE TANK
†† TANK TEMP. SENSOR OR OPTIONAL † TANK TEMP. CONTROL
BALL VALVE
COLD WATER INLET
BUILDING RECIRCULATION LOOP
DRAIN
GW Models are not for instantaneous installations - storage is required.
† Optional 24V control
†† Thermistor probe supplied with GW models
X Installed on GW models

Proper flow rates through the Genesis will result in a 25-40° F temperature rise inlet to outlet.

- Available circulators base sizing on the use of 75 equivalent feet of piping between the storage tank and Genesis.
- Optional right end water connection is available from the factory
- Gas connection is left or right end

GENESIS PUMPS

STANDARD FLOW PUMPS

STANDARD PUMPS - GW MODELS ONLY				
BOILER	MODEL (OR EQUIV.)	IMPELLER DIAMETER	HP	ELECTRIC
GW1000-1500	TACO 1635-S21	4.7"	1/2	7.0/3.5A
GW1800-2500	TACO 1635-S22	5.8"	1	13.4/7.9 A

PRESSURE DROP INCLUDES THE LOSS THROUGH 50 (15.2M) EQUIVALENT FEET OF PIPE AND NORMAL FITTINGS, WHEN INSTALLED WITH STORAGE TANK.

Genesis BTU Input/Output And Flow Rates														
BTU Input/Output			Boiler Rate of Flow and Pressure Drop											
			20 Deg.F Rise		30 Deg.F Rise		40 Deg.F Rise		Maximum Flow Rate			Minimum Flow Rate		
Model #	Input Rating BTU/Hr. Natural & Propane (LP) Gas (000)	Output Rating BTU/Hr. Natural & Propane (LP) Gas	GPM	PD-FT. Head	GPM	PD-FT. Head	GPM	PD-FT. Head	GPM	PD-FT. Head	Deg.F Rise	GPM	PD-FT. Head	Deg.F Rise
GW -1000	990	831,600	83	5.1	55	2.7	42	1.5	154	12.2	11	42	1.5	40
GW -1300	1,300	1,092,000	109	7.2	73	4.2	55	3.2	154	14.5	14	55	3.2	40
GW -1500	1,500	1,260,000	126	10.1	84	6.3	63	4.3	154	16.3	17	64	4.3	40
GW -1850	1,850	1,554,000	154	19	104	10.1	78	6.4	154	18.5	20	78	6.4	40
GW -2100	2,100	1,764,000	N/A	N/A	118	14.5	88	8.3	154	21.3	23	89	8.3	40
GW -2500	2,490	2,091,600	N/A	N/A	139	18.5	105	11.6	154	23.2	28	106	11.6	40

Models	KBTUH Modulation Range (9% Reduction)	Stages*
GB/GW - 1000	297 - 990 (30%)	3
GB/GW - 1300	500 - 1,300 (38%)	3
GB/GW - 1500	500 - 1,500 (33%)	3
GB/GW - 1,800	490 - 1,850 (27%)	4
GB/GW - 2100	500 - 2,100 (24%)	4
GB/GW - 2500	500 - 2,490 (20%)	4

*"Stage" consists of a blower, gas valve, section of manifold, draft switch and Flame Sensor. Stages will each activate based on inlet water temperature or tank temperature probe.

GENESIS 1000-2500 MODELS

Numbers within circles indicate burners and stage sequence (Ex.① = a burner of stage "1")

Stage Sequence - 3 Stage Models

	Burner Configuration By Stage	Stage Layout	Quantity of Components	Quantity of Manifolds
GW/GB 1,000,000	Ignitor, Flame Sensor, Flame Sensor ① ① ① ② ② ② ② Burners of Stage "1" Flame Sensor ③ ③ ③	3 - 4 - 3	1 Ignitor 2 Blowers 3 Gas Valves 3 Flame Sensors 2 Blower Provers	1 Four 2 Three
GW/GB 1,300,000	Ignitor, Flame Sensor, Ignitor ① ① ① ① ① ② ② ② Flame Sensor, Flame Sensor ② ② ③ ③ ③	5 - 5 - 3	2 Ignitors 2 Blowers 3 Gas Valves 3 Flame Sensors 2 Blower Provers	2 Four 1 Five
GW/GB 1,500,000	Ignitor, Flame Sensor, Ignitor ① ① ① ① ① ② ② ② Flame Sensor, Flame Sensor ② ② ③ ③ ③ ③ ③	5 - 5 - 5	2 Ignitors 2 Blowers 3 Gas Valves 3 Flame Sensors 3 Blower Provers	3 Five

Stage Sequence - 4 Stage Models

	Burner Configuration By Stage	Stage Layout	Quantity of Components	Quantity of Manifolds
GW/GB 1,850,000	Ignitor, Flame Sensor ② ② ② ② ② Ignitor, Flame Sensor ① ① ① ① ① ③ ③ ③ Flame Sensor, Flame Sensor ③ ③ ④ ④ ④ ④	5-5-5-4	2 Ignitors 3 Blowers 5 Gas Valves 4 Flame Sensors 3 Blower Provers	3 Five 1 Four
GW/GB 2,100,000	Ignitor, Flame Sensor ② ② ② ② ② ③ ③ ③ Flame Sensor, Ignitor, Flame Sensor ③ ③ ① ① ① ① ① Flame Sensor ④ ④ ④ ④ ④ ④	5-5-5-(3,3)	2 Ignitors 3 Blowers 6 Gas Valves 4 Flame Sensors 3 Blower Provers	3 Five 2 Three
GW/GB 2,500,000	Ignitor, Flame Sensor ② ② ② ② ② ② ② ② Ignitor, Flame Sensor ① ① ① ① ① ③ ③ ③ Flame Sensor, Flame Sensor ③ ③ ③ ④ ④ ④ ④ ④ ④ ④	5-(4,3)-(3,3)-(4,3)	2 Ignitors 3 Blowers 7 Gas Valves 4 Flame Sensors 3 Blower Provers	1 Five 4 Three 2 Four

CENTRAL CONTROL BOARD

1 PER BOILER

(Inside, Bottom of Cabinet)

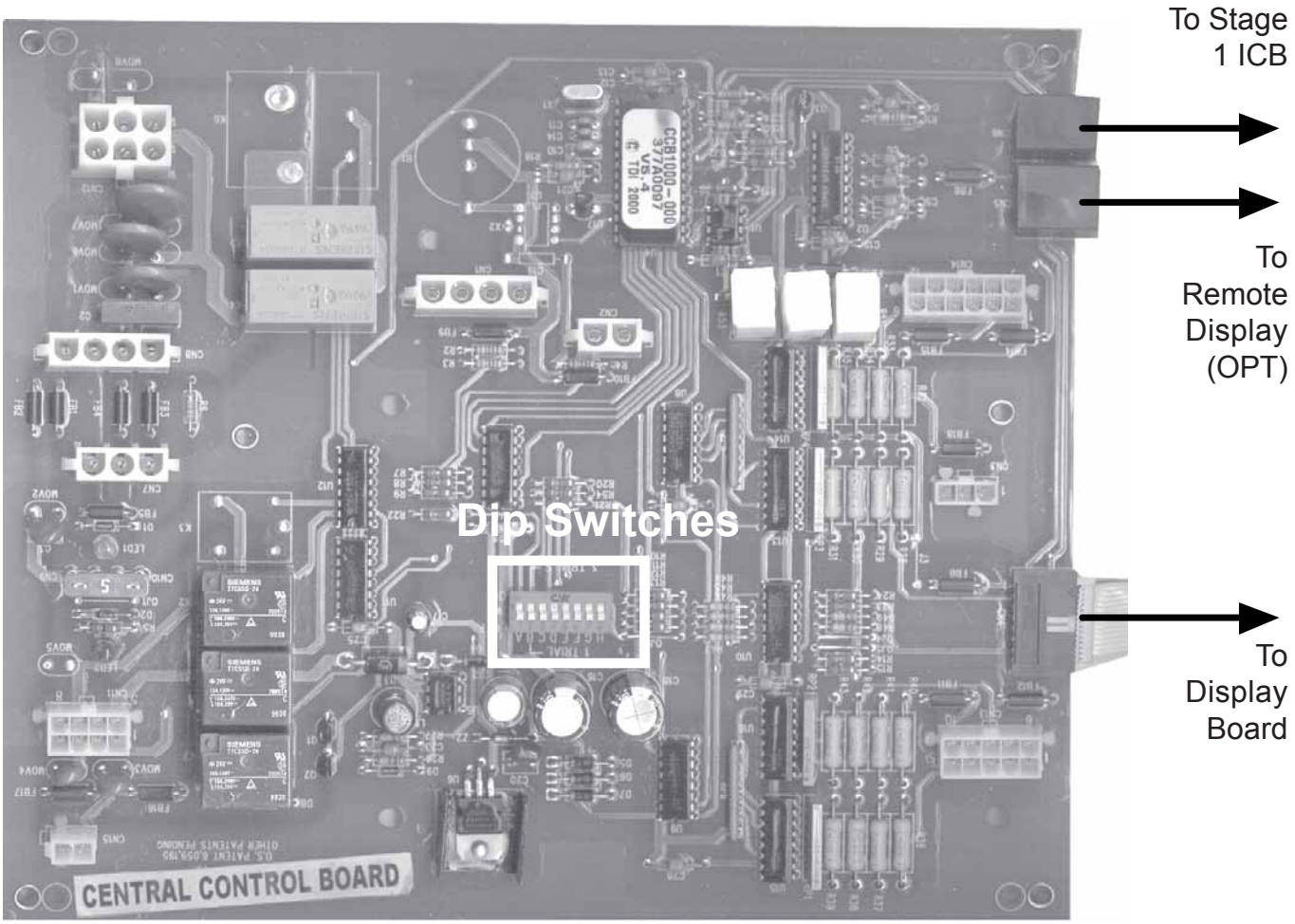
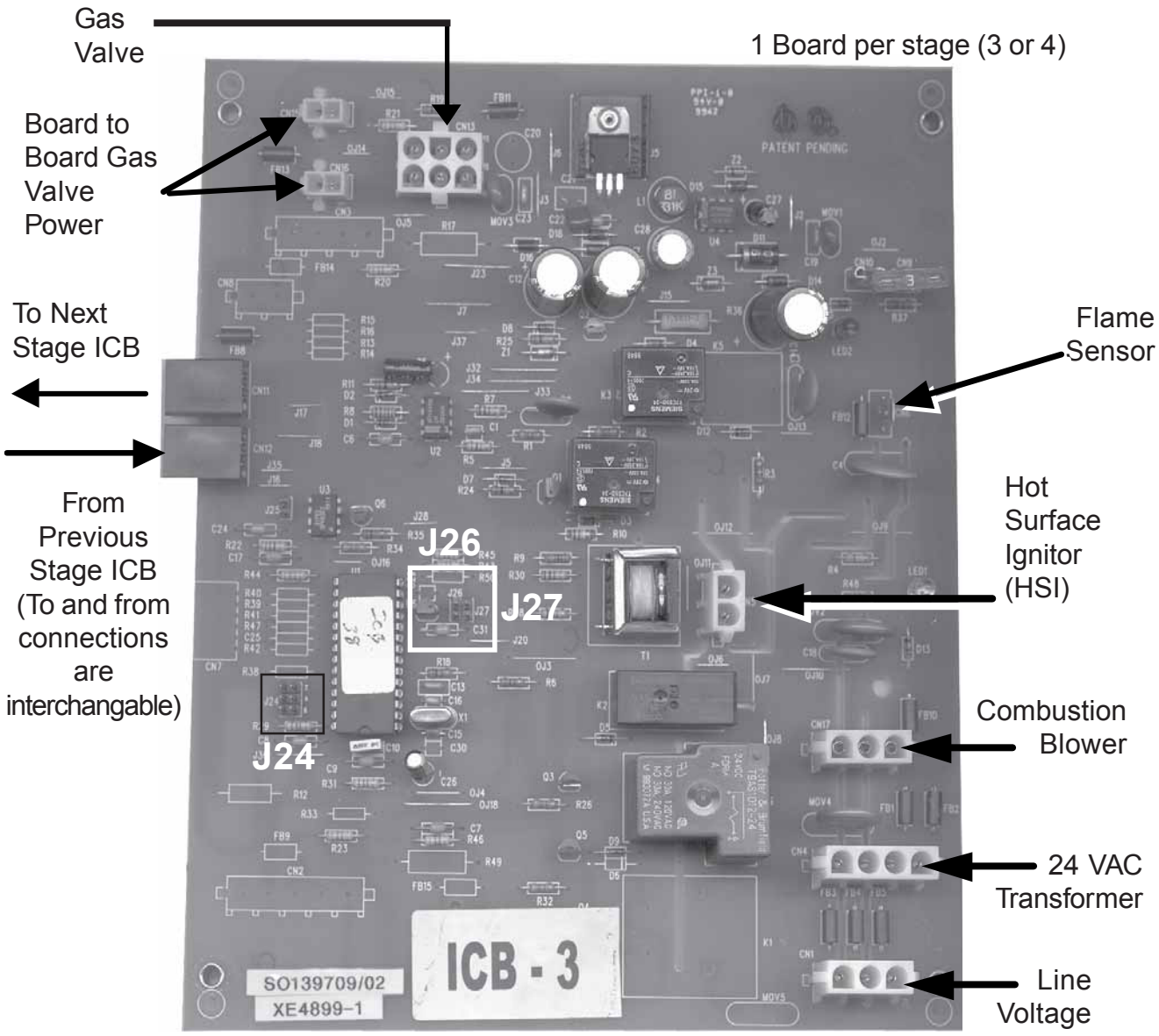


TABLE - CONFIGURATION OF DIP SWITCHES			
SW1	OFF	ON	SELECTION:
A	3 Stage	4 Stage	Either 3 or 4 stage system
B	3 Trials	1 Trial	Either 3 or 1 trial(s) for ignition
C	No IRI gas valve	IRI gas valve	Whether system is IRI or standard
D	Inlet	Tank	Inlet or tank as controlling probe
E	No external TSTAT	External TSTAT	Whether external TSTAT is used
F	Outlet 210° F	Outlet 240° F	Outlet maximum temperature
G	190° F	220° F	Maximum set-point temperature
H	Degrees F	Degrees C	Either °F or °C for displayed temp.

IGNITION CONTROL BOARD

1 PER STAGE

(Inside, Around Walls of Cabinet)



Each ICB is responsible for a:

- combustion blower
- hot surface igniter
- gas valve

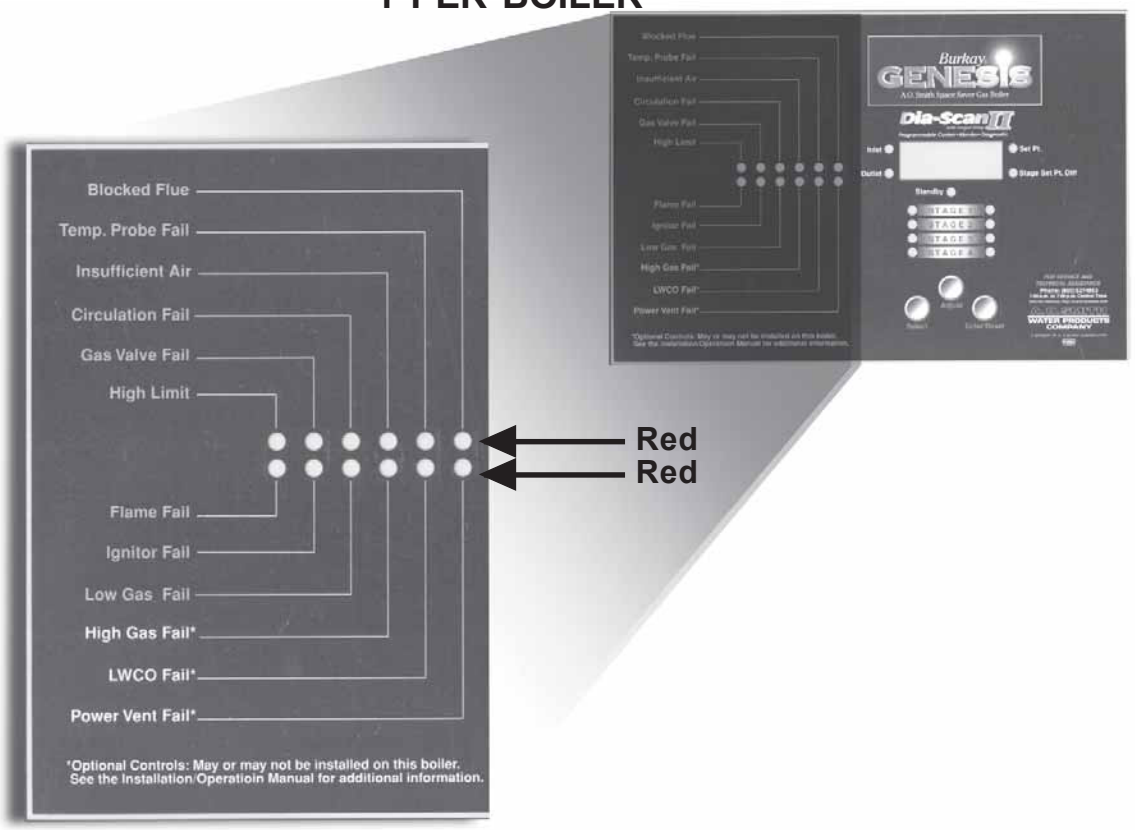
Each ICB will monitor:

- a gas valve
- gas valve relay
- flame sense
- igniter current

Each ICB has changeable jumpers (J24) to provide a unique communication address. Jumpers, J26, J27, also allow the user to disable the igniter and/or blower if they are not connected to the ICB. These jumpers also allow selection of 1 or 2 blower speed operation (not used on these Genesis models). See Page 31.

GENESIS 1000-2500 MODEL'S CONTROL SYSTEMS SPECIFICATIONS

1 PER BOILER



System Display Board

LED Display	4-digit, 7-segment LED display Temperature display for °F or °C
Discrete LEDs	25 LEDs for status/diagnostics
Stage LEDs	4 Red, 4 Green
Diagnostic LEDs	12 Red
ECO Failure Probe Failure Flame Failure Igniter Failure Insufficient Air Blocked Flue Circulate Fail Gas Valve Fail High Gas Fail Low Gas Fail Low Water Cut-Off Power Vent Failure	**Environmental:** **Operating Temperature Range -40°F (-40°C) to 185°F (85 °C) ,** **5-95% RH Non-condensing from 60 °F to 158°F (15.6° to 70° C).**
Indicator LED's	5 Yellow
Inlet/Tank Water Temp Outlet Water Temp Stage Set-Pt. Stage Set-Pt. Diff. Standby	
Pushbutton Switches - 3 Momentary Contact	
Select Pushbutton Adjust Pushbutton Enter/Reset Pushbutton	

SEQUENCE OF OPERATION

3 STAGE MODELS - TEMPERATURE/STAGE LADDER EXAMPLE

Condition:

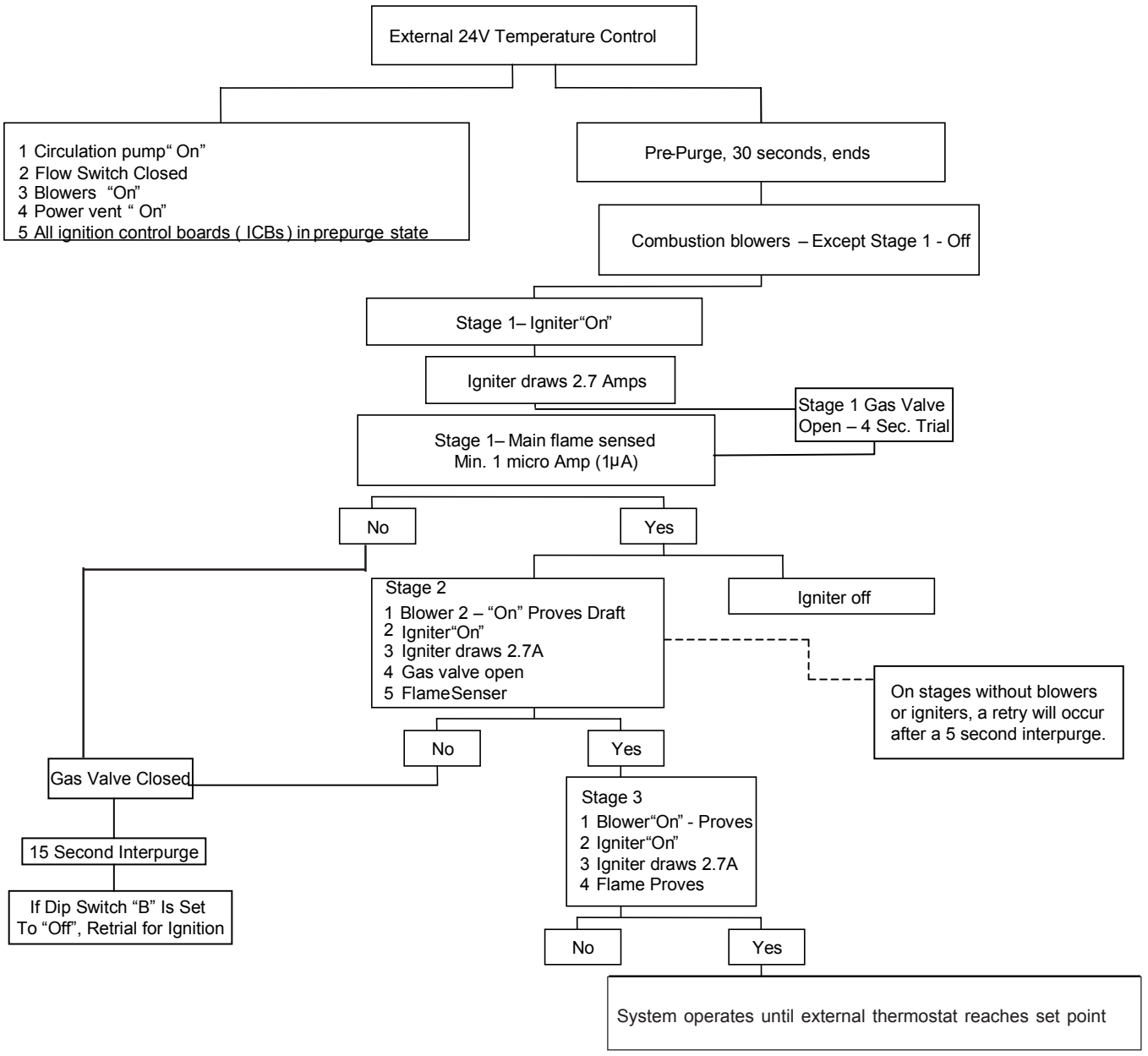
Central control Board (CCB) dip switch settings:

SW1-A Set to "Off" (3 Stage)
SW1-C-Set to "Off" (no IRI gas valve in use)
SW1-E-Set to "On" (external thermostat in use)
All other switches either "On" or "Off"

CONFIGURATION SWITCH TABLE			
SW1	OFF	ON	SELECTION:
A	3 Stage	4 Stage	Either 3 or 4 stage system
B	3 Trials	1 Trial	Either 3 or 1 trial(s) for ignition
C	No IRI gas valve	IRI gas valve	Whether system is IRI or standard
D	Inlet	Tank	Inlet or tank as controlling probe
E	No external TSTAT	External TSTAT	Whether external TSTAT is used
F	Outlet 210° F	Outlet 240° F	Outlet maximum temperature
G	190° F	220° F	Maximum set-point temperature
H	Degrees F	Degrees C	Either °F or °C for displayed temp.

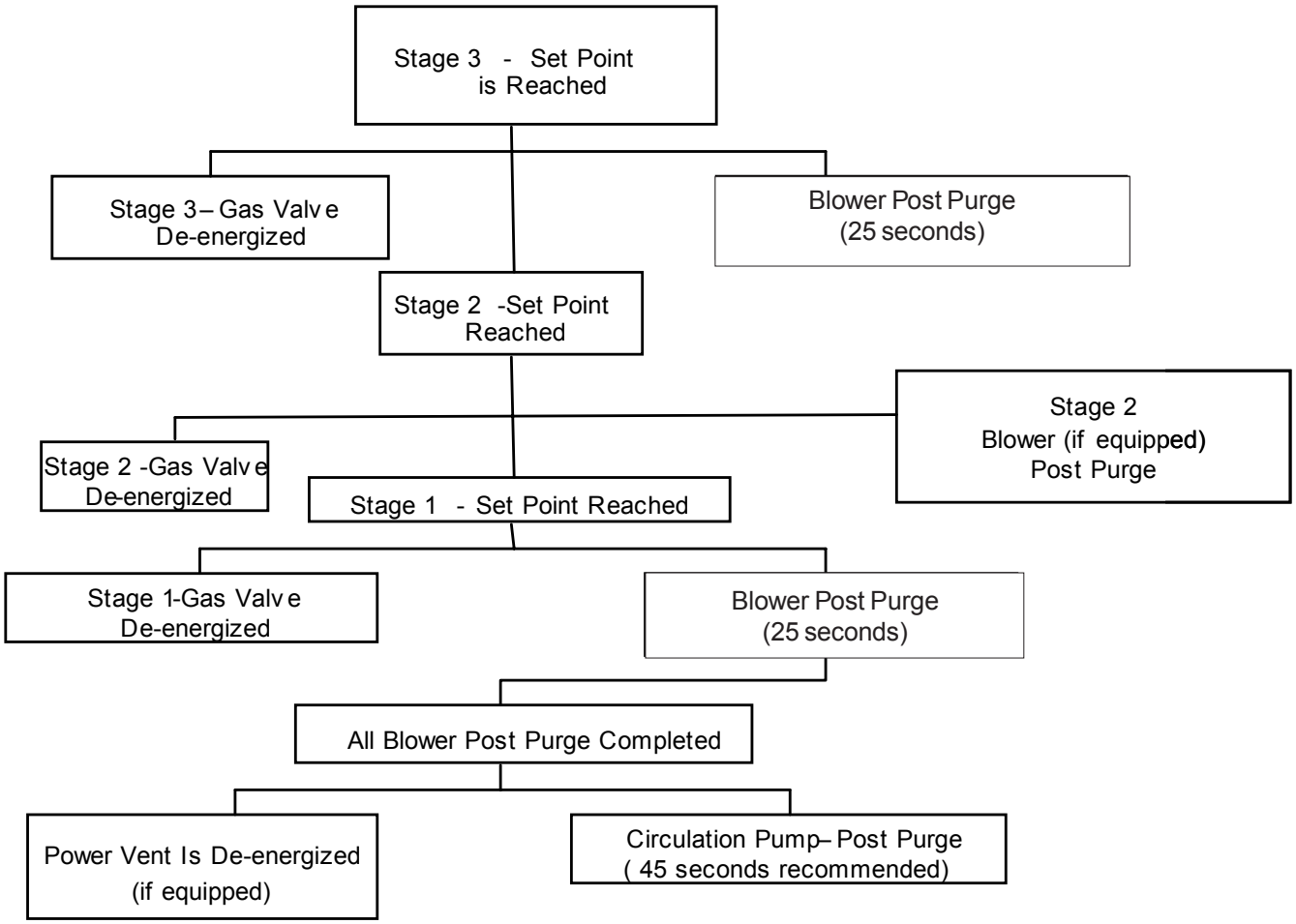
CCB Responsibility:

Staging ICB's
Monitor Safety Limit Devices
Control Circulating Pump
Power Vent (if equipped)
Alarm output (if equipped)
IRI gas valves (If equipped).
Temperature sense from inlet; outlet; tank probe or 24V tank thermostat


External 24V Temperature Control
1 Circulation pump" On"
2 Flow Switch Closed
3 Blowers "On"
4 Power vent " On"
5 All ignition control boards (ICBs) in prepurge state
Pre-Purge, 30 seconds, ends
Combustion blowers – Except Stage 1 - Off
Stage 1– Igniter"On"
Igniter draws 2.7 Amps
Stage 1 Gas Valve Open – 4 Sec. Trial
Stage 1– Main flame sensed Min. 1 micro Amp (1µA)
No
Yes
Stage 2
1 Blower 2 – "On" Proves Draft
2 Igniter"On"
3 Igniter draws 2.7A
4 Gas valve open
5 FlameSenser
Igniter off
On stages without blowers or igniters, a retry will occur after a 5 second interpurge.
No
Yes
Gas Valve Closed
Stage 3
1 Blower"On" - Proves
2 Igniter"On"
3 Igniter draws 2.7A
4 Flame Proves
15 Second Interpurge
If Dip Switch "B" Is Set To "Off", Retrial for Ignition
No
Yes
System operates until external thermostat reaches set point

SHUT DOWN SEQUENCE

3-STAGE MODELS


Stage 3 - Set Point is Reached
Stage 3– Gas Valve De-energized
Blower Post Purge (25 seconds)
Stage 2 -Set Point Reached
Stage 2 Blower (if equipped) Post Purge
Stage 2 -Gas Valve De-energized
Stage 1 - Set Point Reached
Stage 1-Gas Valve De-energized
Blower Post Purge (25 seconds)
All Blower Post Purge Completed
Power Vent Is De-energized (if equipped)
Circulation Pump– Post Purge (45 seconds recommended)

ELECTRICAL INFORMATION

CENTRAL CONTROL BOARD			
SUPPLY CIRCUIT BOARD	**120 VAC; 60 Hz 18-30 VAC, 60 Hz**		
	TEMP SENSING	**TYPE SENSOR**	**CONNECTS TO RECEPTACLES**
Probe#1	Outlet water	Thermistor	CCB CN 1
	High Limit	24 VDC-NC	CCB CN 14
Probe #2	Inlet water	Thermistor	CCB CN1
Probe #3	Remote tank Temp. probe	Thermistor	CCB CN2
or (Opt)	Remote tank thermostat	24 VAC	CCB CN3

SWITCHES - ALL ARE 24VAC	STATISTICS	INCH W.C.	CONNECTS TO RECEPTACLE:
Power Vent Switch (OPT)	N.O.		CCB CN4 & 11
Differential Blower Prover	N.O.	.70 ± .05" to close	CCB CN14
Blocked Flue Switch	N.C.	opens at .60 ± .05"	CCB CN14
*High Gas Pressure Switch	N.C.	opens at 5.25" Nat.; 12.8" Prop	CCB CN13
Low Gas Pressure Switch	N.O.	closes at 4.5"	CCB CN13
Water Flow Switch	N.O.		CCB CN13
*Low Water Cut-off Switch	N.O.		CCB CN11
*IRI Gas Valve Sense			

*Included with IRI (Industrial Risk Insurance) equipped models.

ADJUSTABLE SETTING (ON CCB)	
High Limit/Outlet	Max 250°F (118°C)
Outlet Probe	210°F (99°C) or 240°F (115°C) Via Dip Switch "F"
Inlet or Tank Probe	Minimum Set Point - 80°F (27°C) Maximum Set Point - 190° (87.5°C) or 220°F (104°C) (Via Dip Switch "G")

ENVIRONMENT	
Operating Temp. Range	-40°F to + 185°F (-40°C to +85°C)

ELECTRICAL

Input Power:	
Supply Line	120 VAC, +10%, -15%, 60 Hz
Circuit Board	
Input Specifications:	
Flame Sense	Remote, 120 VAC, 1uA typical microamp
Safety Limit	24 VDC input nominal
Output Specifications:	
High Speed Combustion Blower	120 VAC, 30 LRA/7 FLA
Low Speed Combusion blower	120 VAC, 30 LRA/7 FLA
Hot Surface Igniter	120 VAC, 4.75 A rms resistive
Gas Valve	24 VAC, 4.8 A rms continuous
	12.8 Amps inrush pilot duty load
Igniter current Proving:	
Norton Model 271Y;	2.7 Amps current to prove
Igition Timing:	
Pre-purge (Combusion Blower)	32 ± 2 seconds
Igniter Proving	18 ± 1 seconds
Igniter Activation Period	5 ± 1 seconds
Trial For Ignition Period	6 ± 2 seconds
Flame Establishing Period	1.5 ± 1.5 seconds
Flame Failure Response Time	0 to 1.5 seconds
Inter-Purge	15 ± 2 seconds
Post-purge	25 ± 2 seconds
Communications:	
Board to Board	Serial Multi-Drop Bus
Environmental:	
Operating Temperature Range	(-40° to +185°F)

SETTING SYSTEM CONFIGURATION SWITCHES AND JUMPERS

CENTRAL CONTROL BOARD (CCB) CONFIGURATION

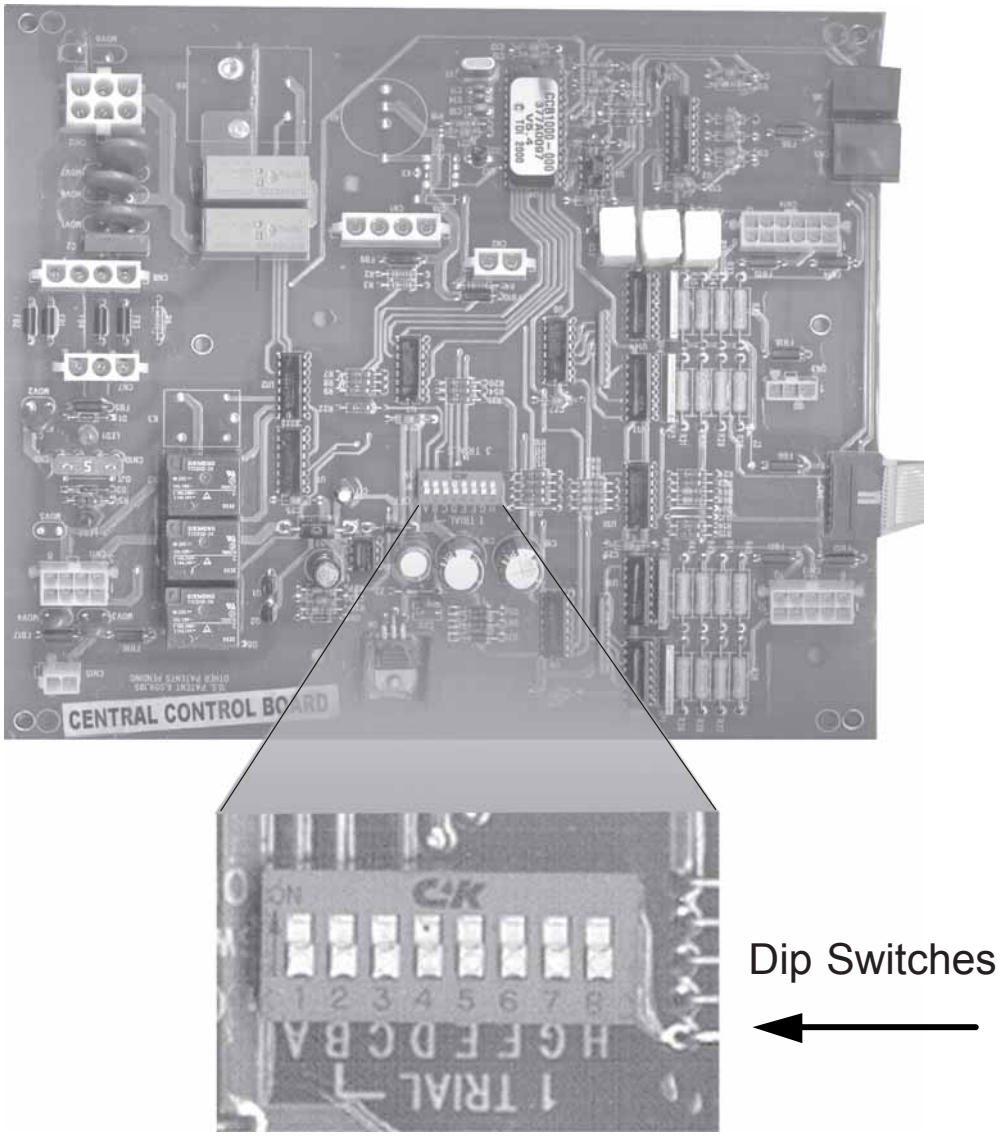


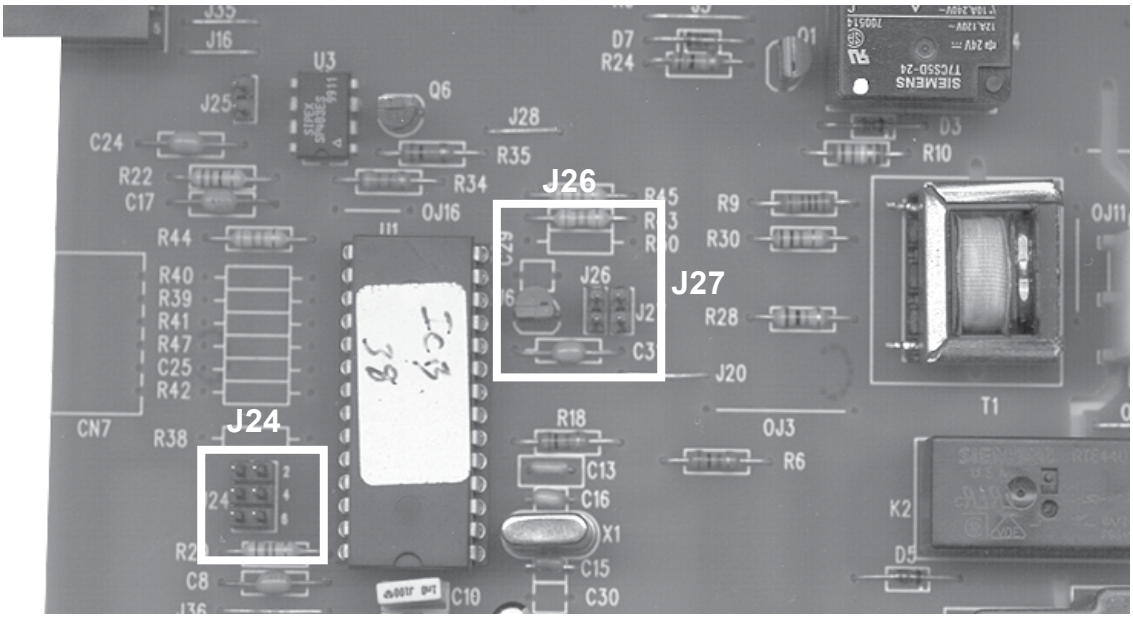
Table - Configuration Of Dip Switches			
SW1	**Off**	**On**	**Selection**
A	3 Stage	4 Stage	Either 3 or 4 Stage System
B	3 Trials	1 Trial	Either 3 or 1 Trial(s) for Ignition
C	No IRI Gas Valve	IRI Gas Valve	Whether System is IRI or Standard*
D	Inlet	Tank	Inlet or Tank as Controlling Probe
E	No External TSTAT	External TSTAT	Whether External TSTAT is Used
F	Outlet 210°F	Outlet 240°F	Outlet Maximum Temperature
G	190°F	220°F	Maximum Set-Point Temperature
H	Degrees F	Degrees C	Either °F or °C for Displayed Temperature

*IRI- Industrial Risk Insurance

CONFIGURATION JUMPERS
ON IGNITION CONTROL BOARD (ICB)

NOTES:

1. Connections CN15 and CN16 are electrically the same -- item cable 2 can be connected to either.
2. Connections CN11 and CN12 are electrically the same -- item 1 cable can be connected to either.



Ignition Control Board Igniter & Combustion Blower Options Table

J26 J27	J26 J27	J26 J27	J26 J27
No Jumpers: Igniter Connected Blower Connected	J26 Jumper Only: Igniter Connected No Blower Connected	J27 Jumper Only: No Igniter Connected Blower Connected	Both J26 & J27 Jumpers: No Igniter Connected No Blower Connected

Ignition Control Board Identification Jumpers Table

J24 - Stage 1	J24 - Stage 2	J24 - Stage 3	J24 - Stage 4
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
No Jumpers Installed	Jumper Pin 5 to 6	Jumper Pin 3 to 4	Jumper Pin 1 to 2

CENTRAL CONTROL CIRCUIT BOARD CONNECTIONS

These connect to Terminal Board strips on the drop down panel - See page 17`.

CCB1000-000 Connector Pin-Out

CN1 - Boiler Inlet/Outlet Temperature probes
- pins 1 & 2 = Outlet probe - Blk/Grn and Blue/Green
- pins 3 & 4 = Inlet probe- Blue and Blue

CN2 - Tank temperature probe
- pin 1 = Thermistor - Yellow
- pin 2 = Thermistor - Yellow

CN3 - External Thermostat
- pin 1 = TSTAT (low side) - Blue/Black
- pin 2 = Not used
- pin 3 = 24VAC to TSTAT - Black/White

CN4 - Display Board

CN5 - RS-232 Serial Communications Cable
- pin 1 = CTS
- pin 2 = RTS
- pin 3 = RXD
- pin 4 - TXD
- pin 5 = GND
- pin 6 = Not used
- pin 7 = GND
- pin 8 = 22-30 VDC

CN6 - CCB to ICB Communications - Cable
- pin 1 = Not used
- pin 2 = GND
- pin 3 = RXD
- pin 4 = TXD
- pin 5 - GND
- pin 6 = Not used

CN7 - Line Voltage Input
- pin 1 = L2 (120 VAC) - Black
- pin 2 = Neutral - White
- pin 3 - Ground - Green

CN8 - Transformer
- pin 1 = L1 (no connection necessary)
- pin 2 = Neutral (no connection necessary)
- pin 3 = Ground - White/Black
- pin 4 = 24 VAC - Black/White

CN9 & CN10 - Fuse

CCB1000-000 Connector Pin-Out

CN11 - 24 VAC Outputs
- pin 1 = Alarm output - Yellow/Brown
- pin 2 = Alarm ground - White/Black
- pin 3 = Power vent output - Red/White
- pin 4 = Power vent ground - White/Black
- pin 5 = LWCO output (unswitched) - Yellow/Violet
- pin 6 = LWCO ground - White/Black
- pin 7 = Not used
- pin 8 = Not used

CN12 - 120VAC Outputs
- pin 1 = To Circulation Pump Contactor Coil - Purple
- pin 2 = Not used
- pin 3 = To Circulation Pump Contactor Coil - White
- pin 4 = To IRI Gas Valve Contactor Coil*
- pin 5 = To IRI Gas Valve Contactor Coil
- pin 6 = Not used

*Industrial Risk Insurance

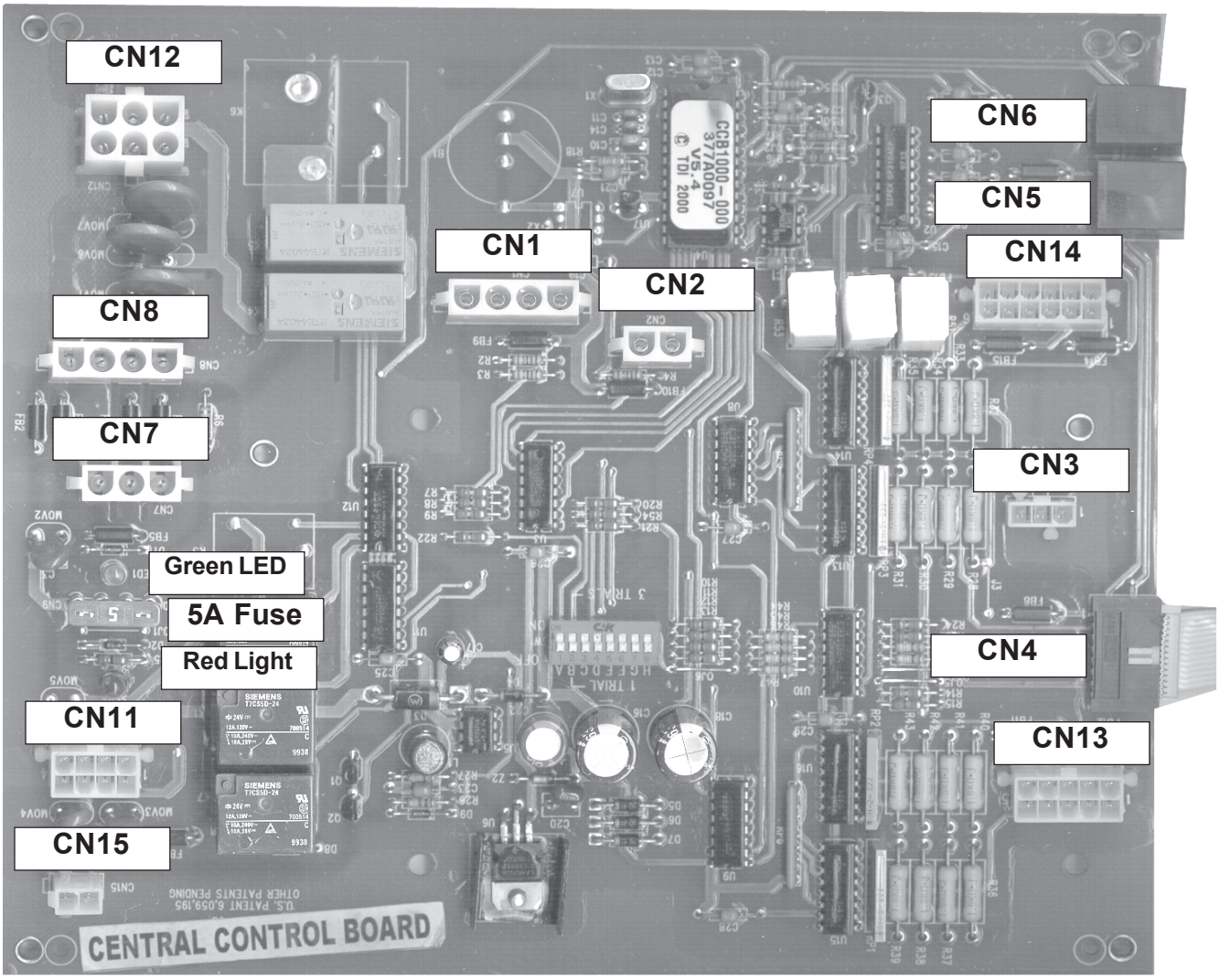
CN13 - Limit Switches
- pin 1 = 24 VAC power to limit switches - Blk/Wht
- pin 2 = From High Gas Switch 1 - White/Red
- pin 3 = From High Gas Switch 2 - Yellow/Green
- pin 4 = From High Gas Switch 3 - White/Violet
- pin 5 = From High Gas Switch 4 - Yellow/Black
- pin 6 = From Low Gas Switch - Red/Green
- pin 7 = From Flow Switch - White/Green
- pin 8 = From LWCO Switch - White/Brown
- pin 9 = From IRI Gas Valve Switch - White/Yellow
- pin 10 = Ground (this is required) - Green

CN14 - Limit Switches
- pin 1 = 24 VAC power to limit switches - Blk/Wht
- pin 2 = 24 VDC power to high limit switch - Red
- pin 3 = From High Limit Switch - Red
- pin 4 = From Power Vent Switch - Yellow/Red
- pin 5 = Fro Air Switch 1 - Black/Yellow
- pin 6 = From Air Switch 2 - Red/Blue
- pin 7 = From Air Switch 3 - Blue/Yellow
- pin 8 = From Air Switch 4 - Black/Red
- pin 9 = From blocked Flue Switch - Blue/Red
- pin 10 = Not used
- pin 11 = Not used
- pin 12 = Ground (this is required) - Green

CN15 - Gas Valve Power (24 VAC)
- pin 1 = 24 VAC to ICB Gas Valve Relay Contacts - Blue/White
- pin 2 = Ground (this is required) - White/Blue

Note: Solid colors are 120VAC circuits.
Stripped colors are 24VAC circuits.

CENTRAL CONTROL CIRCUIT BOARD CONNECTIONS



IGNITION CONTROL CIRCUIT BOARD CONNECTIONS

CN1 - Line Voltage
- pin 1 = L1 (120 VAC)
- pin 2 = Nuetral
- pin 3 = GND - Green

CN17 - Combustion Blower
- pin 1 = 120 VAC output - Black
- pin 2 = Neutral - White
- pin 3 = GND - Green

CN4 - Transformer
- pin 1 = L1 (no connection necessary)
- pin 2 = Neutral (no connection necessary)
- pin 3 = Ground White/Black
- pin 4 = 24 VAC Black/White

CN5 - 120 VAC
- pin 1 = 120V Igniter - Orange
- pin 2 = Ground (this is required) - Orange

CN6 - Flame Sense
- pin 1 = Flame sense rod connection - Brown

CN13 - Gas Valve
- pin 1 = Not used
- pin 2 = Not used
- pin 3 = 24 VAC to gas valve - Yellow/Blue
- pin 4 = Not used
- pin 5 = Not used
- pin 6 = GND to gas valve (Ground) - Red/Yellow

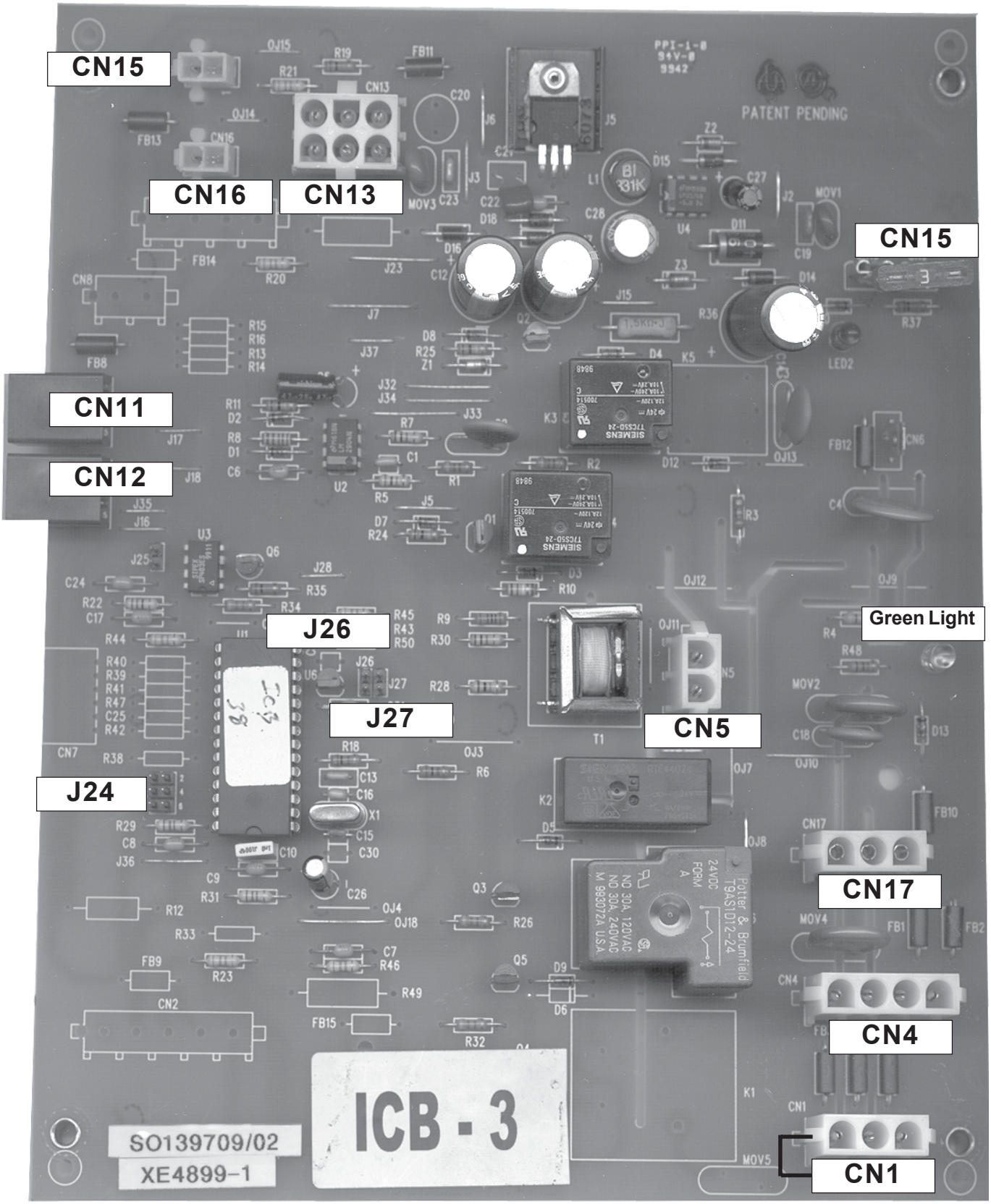
CN15 - Gas Valve Power - Power to next Stage ICB
- pin 1 = 24 VAC - Blue/White - To ICB Gas Valve Relay Contacts
- pin 2 = GND - White/Blue

CN16 - Gas Valve Power - Power from previous Stage ICB
- pin 1 = 24 VAC - Blue/White - From ICB Gas Valve Relay Contacts
- pin 2 = GND - White/Blue

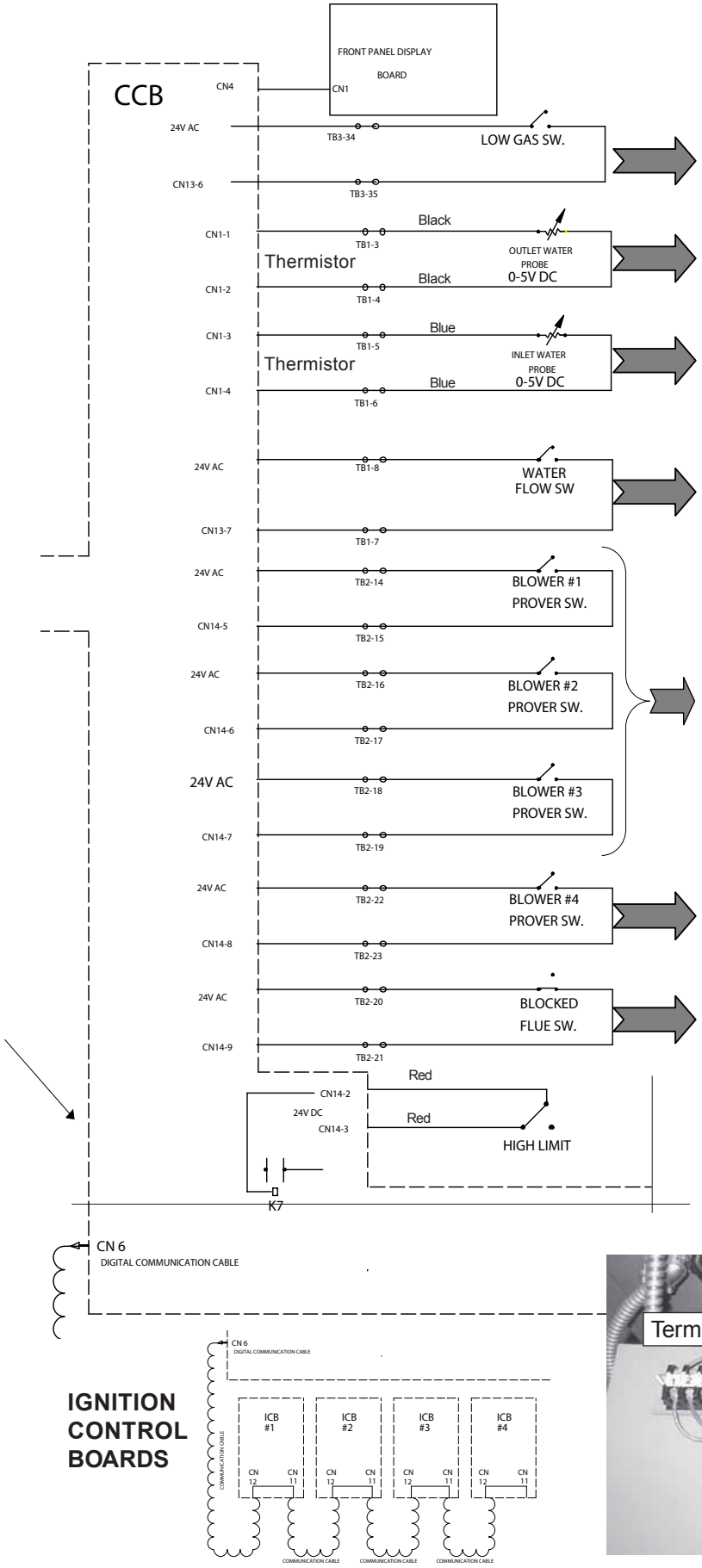
CN11 - CCB to ICB Serial Comunications Cable
- pin 1 = Not used
- pin 2 = GND
- pin 3 = RXD (receive lead) - Received Lead
- pin 4 = TXD (transmit lead) - Transmit Lead
- pin 5 = GND
- pin 6 = Not used

CN12 - CCB to ICB Serial Communications Cable
- pin 1 = Not used
- pin 2 = GND
- pin 3 = RXD
- pin 4 = TXD
- pin 5 = GRD
- pin 6 = Not used

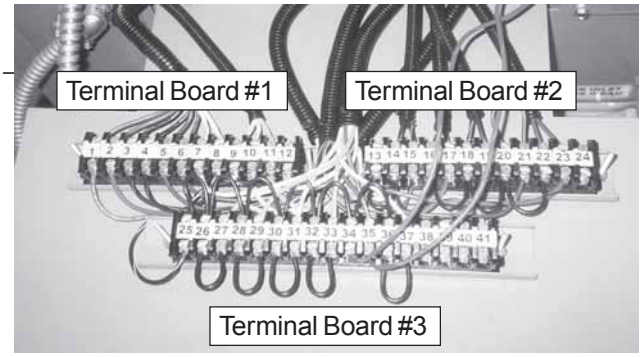
IGNITION CONTROL CIRCUIT BOARD CONNECTIONS



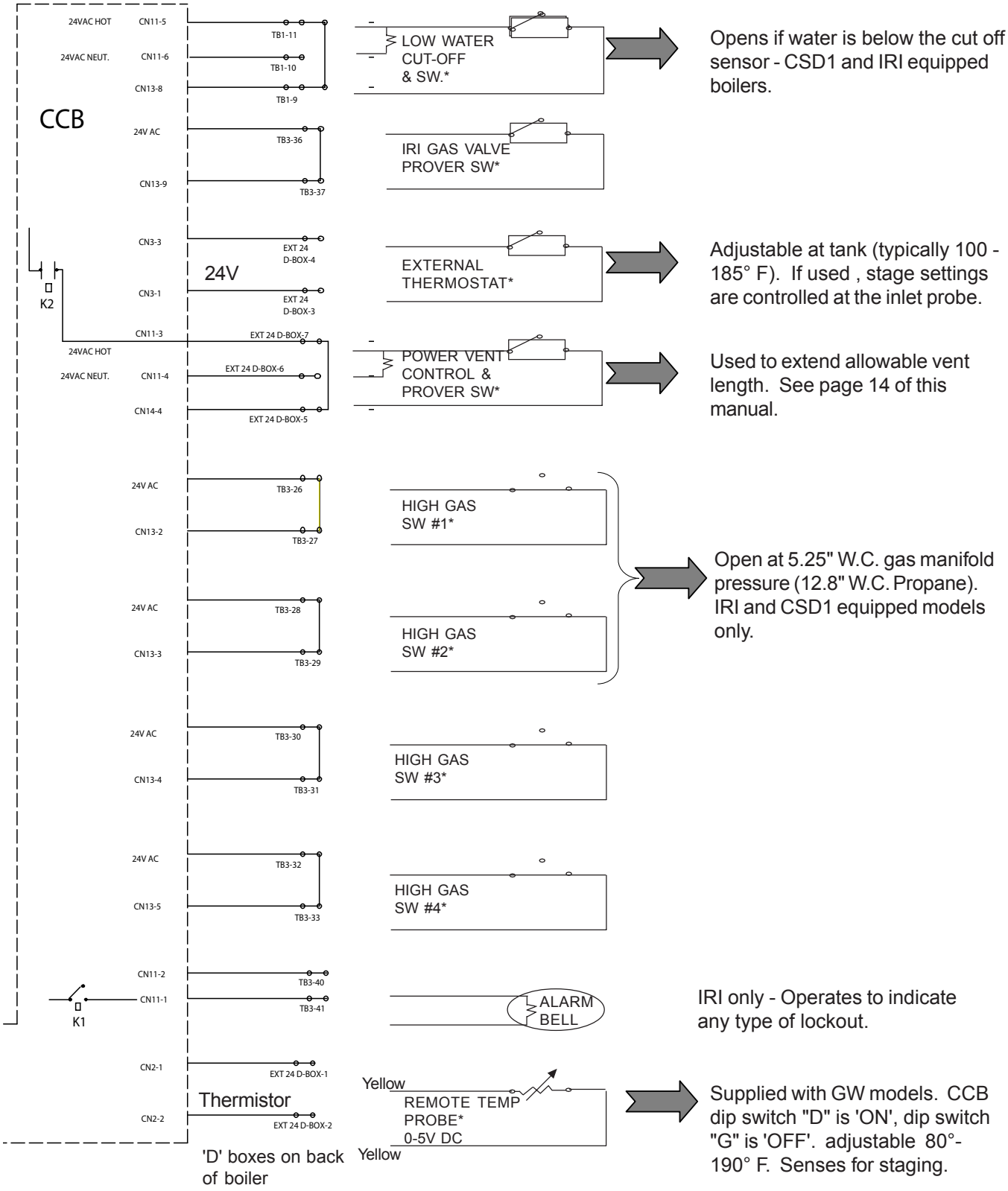
CENTRAL CONTROL BOARD



IGNITION CONTROL BOARDS



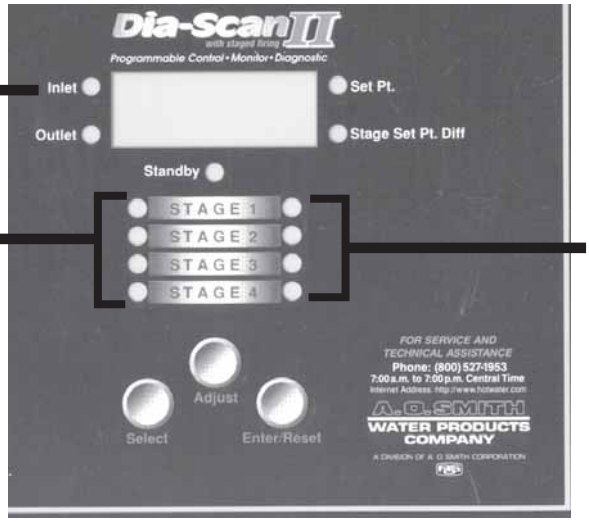
CENTRAL CONTROL BOARD



OPTIONAL INPUTS

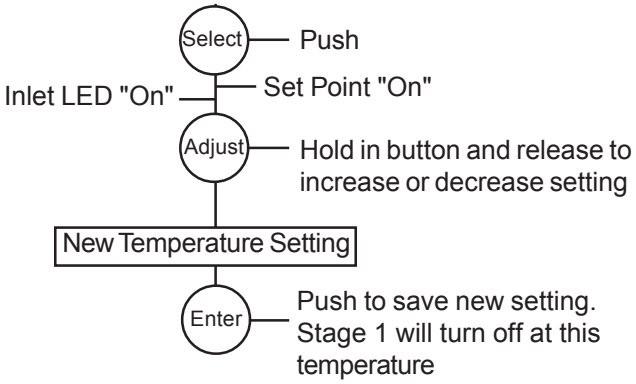
1. This unit may have all, some, or none of the above options.
2. For correct number of blowers & blower prover switches. Plesse consult the wiring diagram as supplied with the unit.

SYSTEM DISPLAY BOARD

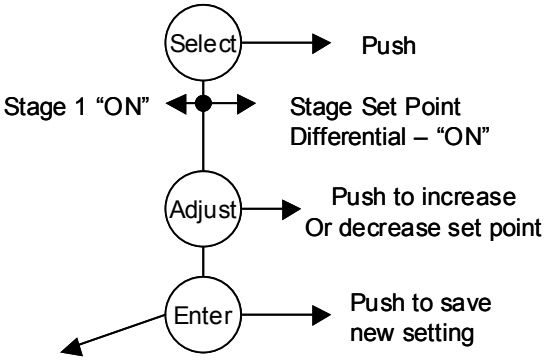


Display will indicate inlet or tank temperature (depending on Dip Switch SW1-D) Genesis must be operated after 1 complete cycle with the new settings to "lock" them into memory

To Display/Change Inlet or Tank Set Points

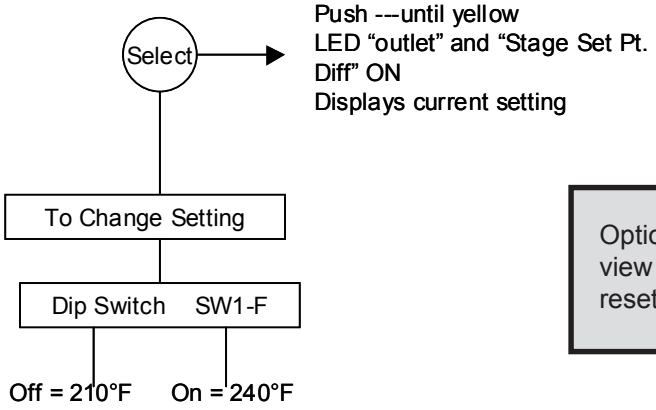

Select
Push
Inlet LED "On"
Set Point "On"
Adjust
Hold in button and release to increase or decrease setting
New Temperature Setting
Enter
Push to save new setting. Stage 1 will turn off at this temperature

To Display/Change Inlet or Tank Set Points



To view set point temperature minus set point differential. Press and hold Enter Button. This will be the "turn on" temperature for Stage 1 and "turn off" temperature for Stage 2.

To Change Outlet Maximum Temperature Setting

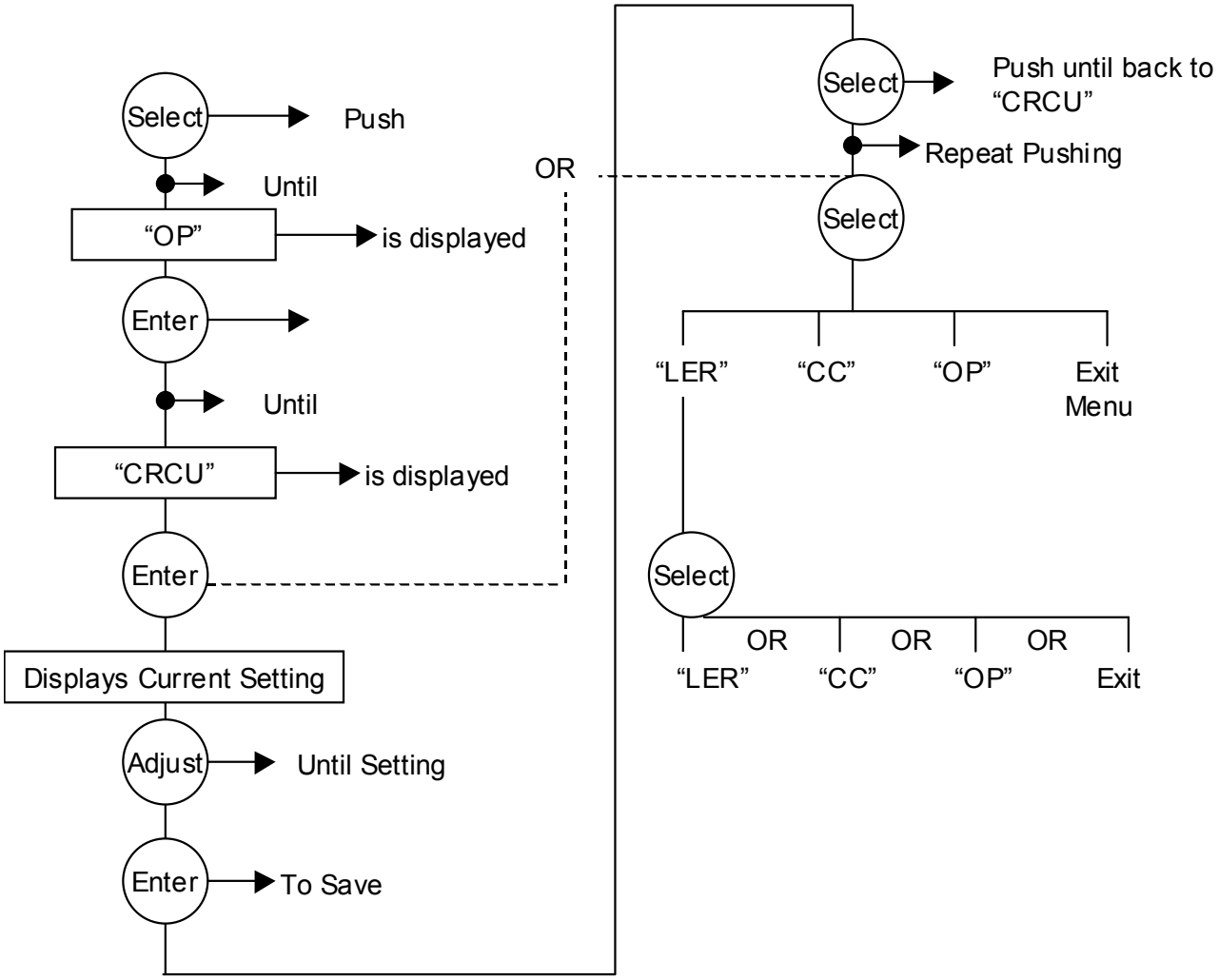


Options Menu (OPT) allows user to view last error (LER), view or change post-circulate time (CRCU) and view or reset each Stages' Gas Valve cycle count (CC)

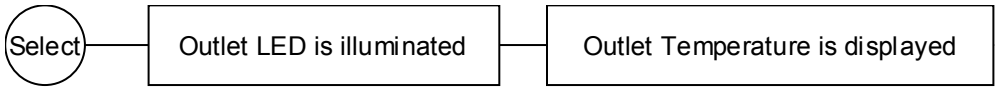
SYSTEM DISPLAY BOARD - continued

Display will indicate inlet or tank temperature (depending on Dip Switch SW1-D) Genesis must be operated with the new settings to "lock" them into memory

Post-Circulate Time
45, 90 180 seconds or continuous
45 seconds recommended.



Outlet Temperature



Post circulate (CRCU) may be adjusted for 45, 90, 180 seconds or continuous.
Cycle count (CC) for each Stage's Gas Valve may count 1-199 cycles and may be reset to "0".
Last error code would indicate a number between 000-210.

FAULT CONDITIONS CATEGORIZED BY BOILER

TERMS:
Soft Lockout: Can be reset by pressing the Enter/Reset push button on the control display. If this push button is NOT pressed, the control will re-initiate an ignition process)provided the call-for-heat is still present) after (1) one hour. This process will continue hourly as long as there is a call-for-heat.
Error Codes between 030 and 070 are "Soft Lockouts".
Hard Lockout: Requires a manual reset. Push the Enter/Reset push button on the control display. *Note: Cycling power off and on will NOT reset the control. All codes NOT between 030 and 070 are "Hard Lockouts"*

"Limit String Faults" are faults associated with one or more of the following items:

- ECO/High Limit
- LWCO
- Circulate (Flow Switch)
- Insufficient Air
- Blocked Flue
- Power Vent Failure
- Low Gas Failure
- High Gas Failure
- IRI Gas Valve Sense

"Application/Control" Faults are faults associated with the following items:

- No Gas Valve Power
- Igniter Failure
- Gas Valve Relay Failure
- Flame Failure
- Temperature Probe Failures
- *PCB Communication Fault

Switch "De-Bouncing"

All limit string devices monitored by the Control are put through a "de-bounce" routine to ensure the validity of the fault. The "de-bounce" routine introduces a delay of nominally 6 seconds.

NOTE: *The temperature high limit switch (ECO/High Limit) is physically connected in the safety limit string. If this switch should momentarily physically open, power to the Gas Valve is immediately interrupted. The Control software cannot "de-bounce" this physical action.*

*Fault operation for a PCB communication fault is identical to the fault operation of a temperature probe fault. Therefore, to determine the fault operation when a PCB communication fault occurs, refer to the temperature probe fault operation.

FAULT CONDITIONS CATEGORIZED BY BOILER

CALL-FOR-HEAT/PRE-CIRCULATE STATE

Limit String Fault: During call-for-heat/pre-circulate, if the Control senses a limit string fault, the Control will wait 60 seconds (nominal) for the fault to clear. If after 60 seconds the Control still senses a limit string fault, the Control will determine the exact fault condition, and then enter the lockout mode. The appropriate LED will illuminate and an error code is displayed. If applicable, a Red stage LED will illuminate. The appropriate LED(s) will remain illuminated until the Control receives a **manual reset**, or if a soft lockout has occurred, **one hour** after the fault occurred. [Ex: circulation (Flow Switch) LED "ON". Circulation fail LOCO 030 - on display.]

Temperature Probe Fault: During call-for-heat/pre-circulate, if the control detects an open or shorted temperature sensor in the controlling temperature probe, or in the Appliance Max. Temperature Probe (Outlet Probe), the Control will wait 60 seconds (nominal) for the fault to clear. If after 60 seconds the Control still senses a temperature probe fault, the Control will determine the exact fault condition, and then enter the lockout mode. The appropriate LED will illuminate and an error code is displayed. The appropriate LED(s) will remain illuminated until the Control receives a manual reset. Unused temperature probes are not monitored.

PRE-PURGE STATE

Limit String Fault: During pre-purge, if the Control senses a limit string fault, the Control will wait 5 minutes (nominal) for the fault to clear. If after 5 minutes the Control still senses a limit string fault, the Control will determine the exact fault condition, and then enter the lockout mode. The appropriate LED will illuminate and an error code is displayed. If applicable, a Red stage LED will illuminate. The appropriate LEDs) will remain illuminated until the Control receives a **manual reset**, or if a soft lockout has occurred, **one hour** after the fault occurred.

Temperature Probe Fault: During pre-purge, if the Control senses an open or shorted temperature sensor in the controlling temperature probe, or in the Appliance Max, Temperature Probe (Outlet Probe), the Control will wait 5 minutes (nominal) for the fault to clear. If after 5 minutes the Control still senses a temperature probe fault, the Control will determine the exact fault condition, and then enter the lockout mode. The appropriate LED(s) will illuminate and an error code is displayed. The appropriate LED(s) will remain illuminated until the Control receives a **manual reset**. Unused temperature probes are not monitored.

IGNITER WARM-UP STATE

Limit String Fault: During igniter warm-up, if the Control senses a limit string fault, the Control will enter the **lockout mode**. The appropriate LED will illuminate and an error code is displayed. If applicable, a Red stage LED will illuminate. The appropriate LED(s) will remain illuminated until the Control receives a **manual reset**, or if a soft lockout has occurred, **one hour** after the fault occurred.

Igniter Failure: After detecting a failure, the blower associated with the stage in which the failure occurred will remain running. The stage will retry for ignition. If the failure continues after one or three attempts (depending on the trial configuration), all active blowers will proceed to a 25 seconds (nominal) post-purge, and the pump will function per the programmed post-circulate time. The Control will proceed to a hard lockout. The red igniter Failure LED will illuminate and the display will show an error code

FAULT CONDITIONS CATEGORIZED BY BOILER

corresponding to the stage in which the failure occurred. A red stage LED, corresponding to the stage in which the failure occurred, will also illuminate. The appropriate LED(s) will remain illuminated until **manual reset**.

Temperature Probe Fault: If the control detects an open or shorted temperature sensor in the controlling temperature probe, or in the Appliance Max. Temperature Probe (Outlet Probe), the control will enter the lockout mode. The appropriate LED will illuminate and an error code is displayed. The appropriate LED(s) will remain illuminated until the Control receives a **manual reset**. Unused temperature probes are not monitored. (Ex. "Temp Probe Fail" red LED 'On'. Display "Temp Probe Fail High Limit LOCO 010).

TRIAL FOR IGNITION STATE

Limit String Fault: During trial-for-ignition, if the Control senses a limit string fault, the Control will enter the lockout mode. The appropriate LED will illuminate and an error code is displayed. If applicable, a Red stage LED will illuminate. The appropriate LED(s) will remain illuminated until the Control receives a **manual reset**, or if a soft lockout has occurred, **one hour** after the fault occurred.

Temperature Probe Fault: If the control detects an open or shorted temperature sensor in the controlling temperature probe, or in the Appliance Max. Temperature Probe (Outlet Probe), the control will enter the lockout mode. The appropriate LED will illuminate and an error code is displayed. The appropriate LED(s) will remain illuminated until the Control receives a **manual reset**. Unused temperature probes are not monitored.

HEATING STATE

Limit String Fault: During heating, if the Control senses a limit string fault, the Control will enter the lockout mode. The appropriate LED will illuminate and an error code is displayed. If applicable, a Red stage LED will illuminate. The appropriate LED(s) will remain illuminated until the Control receives a **manual reset**, or if a soft lockout has occurred, **one hour** after the fault occurred.

Gas Valve Relay Failure: After detecting the failure, the blower associated with the stage in which the failure occurred will proceed to a 15 second (nominal) inter-purge. The stage will then retry for ignition. If the failure continues after one or three attempts (depending on the trial configuration), all active blowers will proceed to a 25 second (nominal) post-purge, and the pump will function per the programmed post-circulate time. The Control will proceed to a **hard** lockout. A red Gas Valve LED will illuminate and the display will show an error code corresponding to the stage in which the failure occurred. A red stage LED, corresponding to the stage in which the failure occurred, will also illuminate. The appropriate LED(s) will remain illuminated until **manual reset**.

Flame Failure (Ignition Failure): After detection of loss of flame, the controller will shut off the stage gas valve(s), and all other gas valves associated with the subsequent stages, if applicable, and proceed to a 15 second (nominal) inter-purge. The stage is given one or three retry attempts, depending upon the trial configuration. If ignition is not successful after one or three attempts, (depending on the trial configuration), all active blowers will go into a 25 second (nominal) post-purge, and the pump will function per the programmed post-circulate time. The controller will go into a hard lockout, and the

FAULT CONDITIONS CATEGORIZED BY BOILER

flame failure fault condition is written to nonvolatile memory within 4 seconds. The red Flame Failure LED will illuminate and the display will show an error code corresponding to the stage on which the failure occurred. The appropriate Red stage LED will also illuminate. The appropriate LED(s) will remain illuminated until **manual reset**.

No Gas Valve Power Sensed: After detecting the failure, the blower associated with the stage in which the failure occurred will proceed to a 15 second (nominal) inter-purge. The stage will then retry for ignition. If the failure continues after one or three attempts (depending on the trial configuration), all active blowers will proceed to a 25 second (nominal) post-purge, and the pump will function per the programmed post-circulate time. The Control will proceed to a **hard** lockout. The display will show an error code corresponding to the stage on which the failure occurred. The appropriate LED(s) will remain illuminated until **manual reset**.

Temperature Probe Fault: If the control detects an open or shorted temperature sensor in the controlling temperature probe, or in the Appliance Max. Temperature Probe (Outlet Probe), the control will enter the lockout mode. The appropriate LED will illuminate and an error code is displayed. The appropriate LED(s) will remain illuminated until the Control receives a **manual reset**. Unused temperature probes are not monitored.

POST PURGE

Limit String Fault: During post purge, if the Control senses a limit string fault, the Control will enter the lockout mode. The appropriate LED will illuminate and an error code is displayed. If applicable, the Red stage LED will illuminate. The appropriate LED will remain illuminated until the Control receives a **manual reset**, or if a soft lockout has occurred, one hour after the fault occurred.

Temperature Probe Fault: if the control detects an open or shorted temperature sensor in the controlling temperature probe, or in the Appliance Max. Temperature Probe (Outlet Probe), the control will enter the lockout mode. The appropriate LED will illuminate and an error code is displayed. The appropriate LED(s) will remain illuminated until the Control receives a **manual reset**. Unused temperature probes are not monitored.

TROUBLESHOOTING ERROR CODES

Soft Lockout: *Can be reset by pressing the Enter/Reset push button on the control display. If this push button is NOT pressed, the control will re-initiate an ignition process (provided the call-for-heat is still present) after (1) hour. This process will continue hourly as long as there is a call-for-heat.*

Error Codes between 030 and 070 are "Soft Lockouts"
All codes NOT between 030 and 070 are "Hard Lockouts".

Hard Lockout: *Requires a manual reset. Push the Enter/Reset push-button on the control display.*

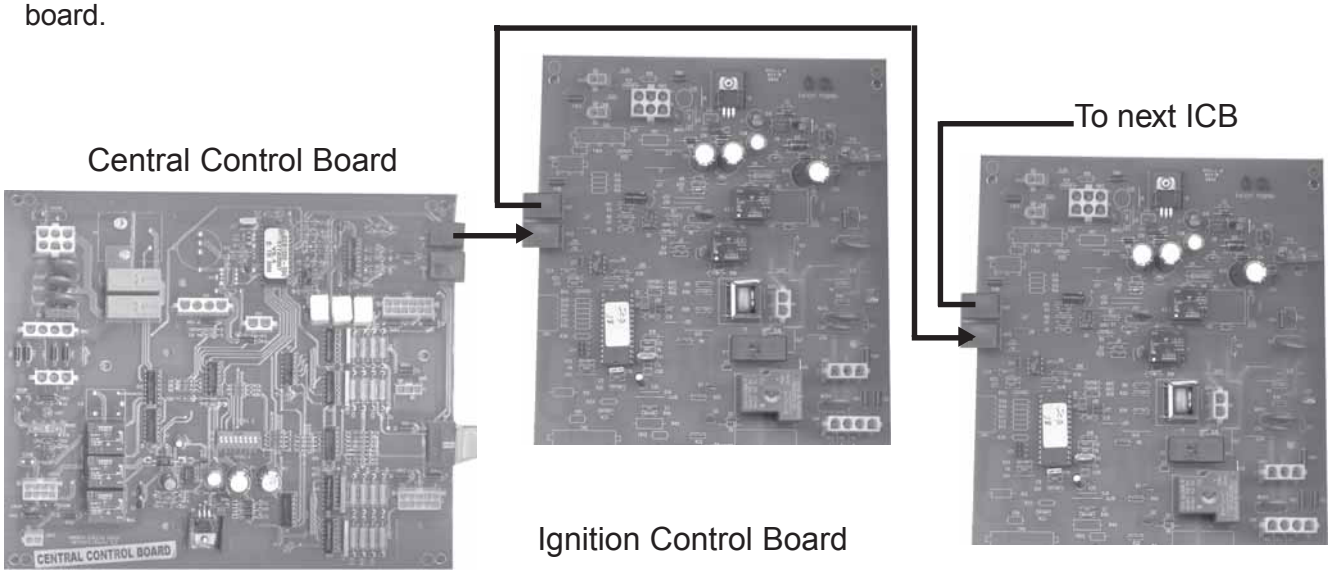
Note: Cycling power off and on will NOT reset the control

Error Codes in Display Window

Error Code "00" Stage 1, 2, 3 or 4

- **Red Light "On"** Indicates failure to communicate with previous board.

Display will show "LOCO 00?" (Lockout Stage 00?) to indicate a communication fault with previous board.

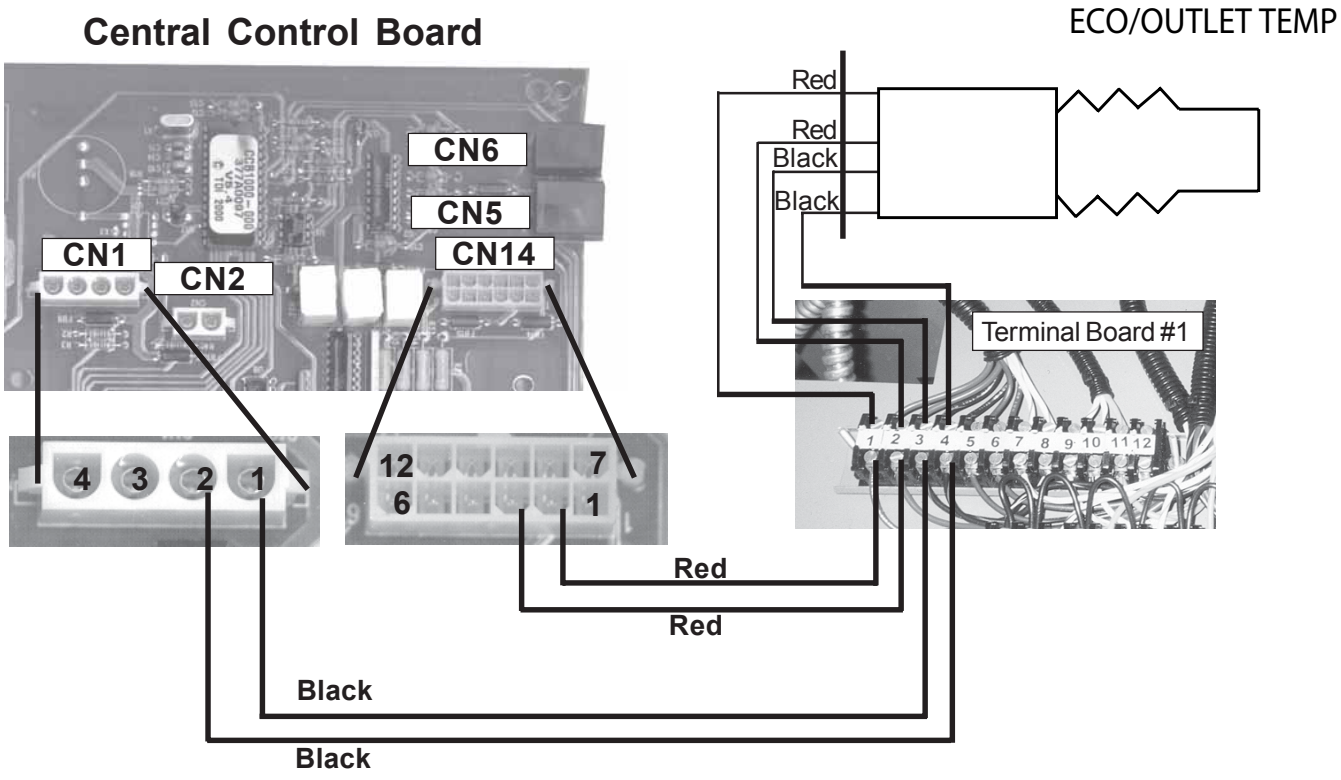


"00" indicates a Communication Fault from board to board - The last numer in the code is the Stage (Ex. 001 = Stage 1)		
Lockout Status	**If error code is …**	**… then**
Hard	001	• check cable from CCB CN6 to Stage 1 ICB CN12 recepticle. • trade with a "good" cable to determine if the cable or ICB 1 board is defective
	002	• check cable from indicated Stage Plug CN12 back to previous Stage Plug CN 11 • trade with "good" cable to determine if cable or indicated ICB board is defective.
	003	
	004	

TROUBLESHOOTING ERROR CODES

Error Code "010"

- Display - High Limit LED "On"
- Display will show "LOCO 010"
- Power is "ON" - Plugs are in receptacles



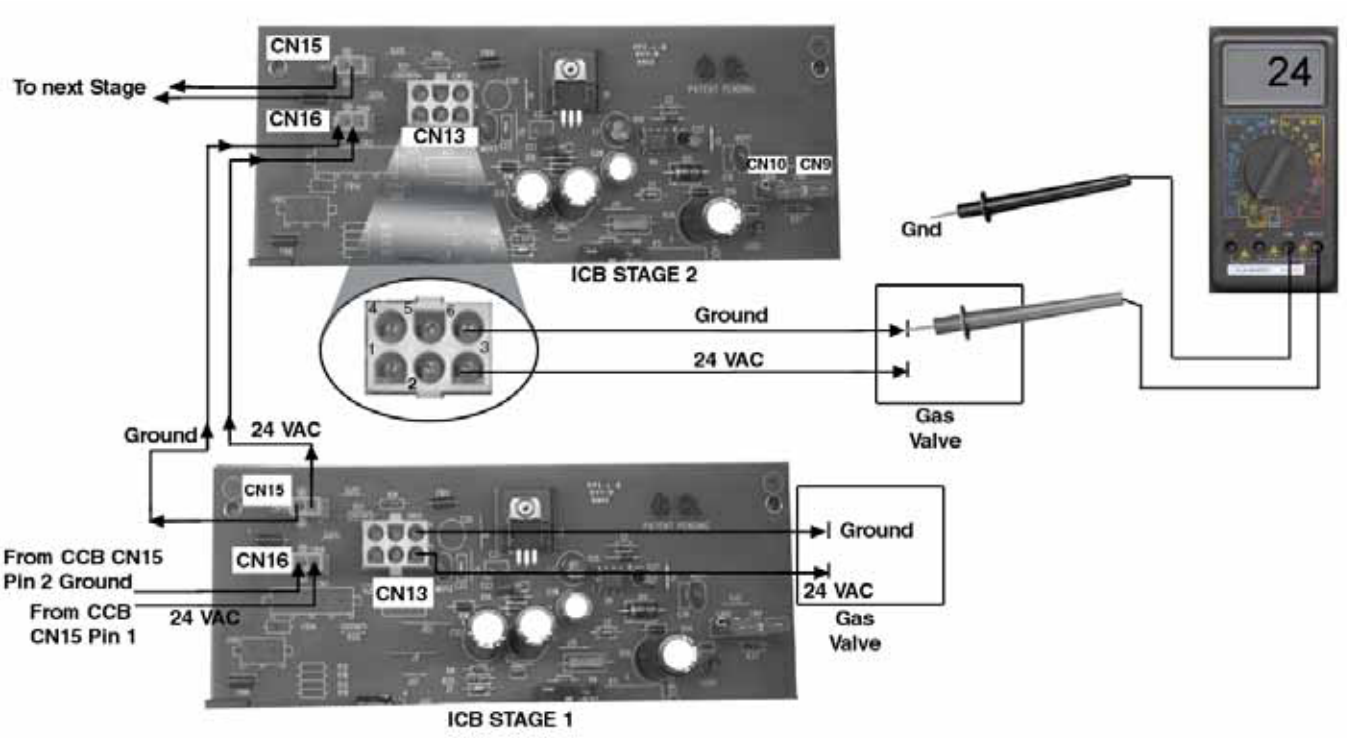
Red Wires are to High Limit ECO (24VDC)
Black wires are to Temperature Probes (Thermistor)
< 5VDC

TROUBLESHOOTING ERROR CODES

Error Code "01" Stage 1, 2, 3, or 4 - No Gas Valve Power

- On Display Board red light is on "Gas Valve Fail"
- Red indicates Stage LED - On
- **Display Window** will show "LOCO - 01?" The Stage Gas Valve did not receive power to open.
- Power is "ON" - Plugs are in receptacles

Ignition Control Board



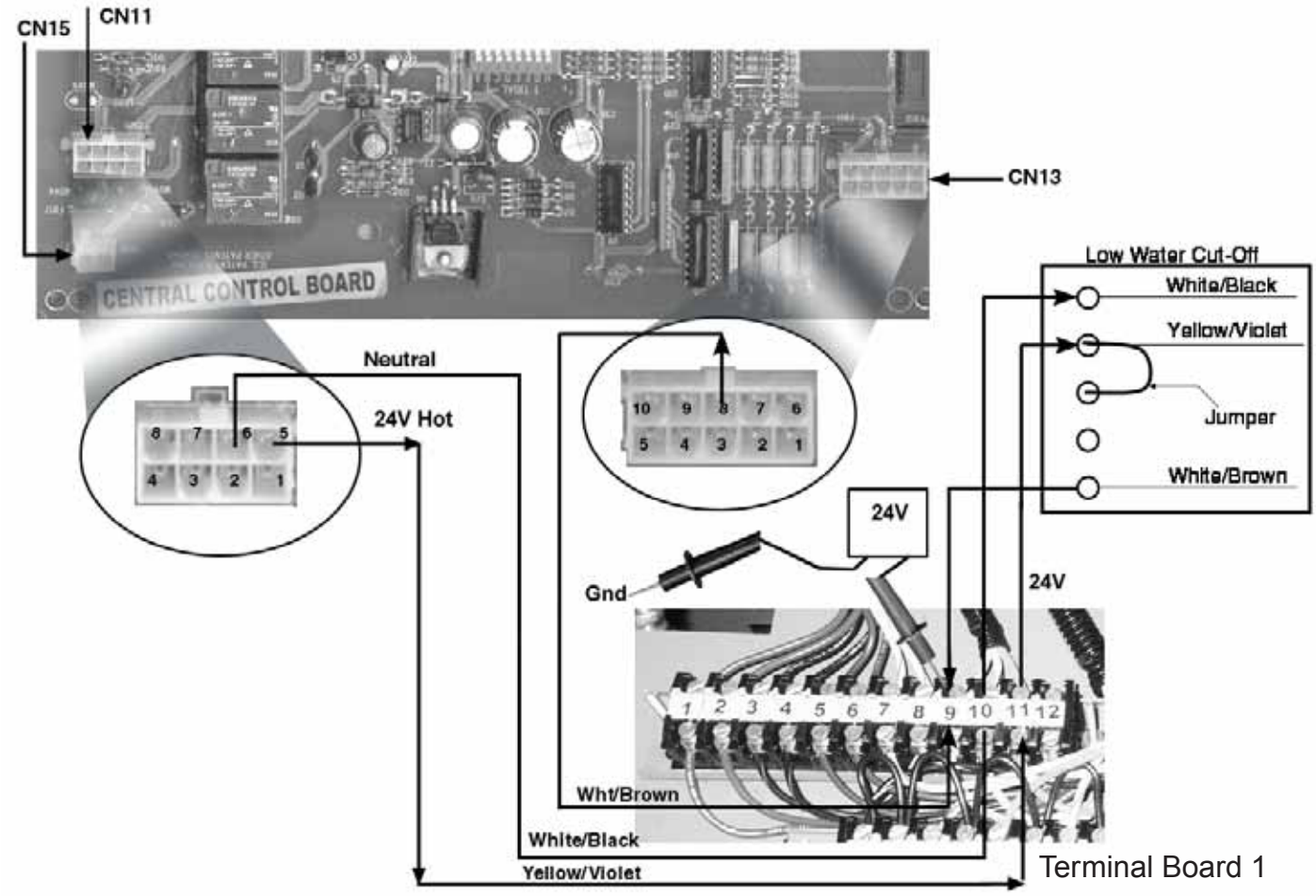
"01?" indicates No Gas Valve Power Sensed - The last number in the code is the Stage Ex. 011 = Stage 1)		
Lockout Status	**If error code is …**	**… then**
Hard	011 012 013 014	• check plug connect to ICB - CN15 and CN16 for appropriate stage • trade with "good" harness to determine if harness or ICB is • check connections between control panel harness assembly and 24 VAC ICB harness assembly

TROUBLESHOOTING ERROR CODES

Error Code "020" - Additional Control to Meet CSD-1 or IRI Code Requirements - A Low Water Cut Off Switch

- On Display Board red light is on "LWCO Fail*"
- **Display Window** will show "LOCO 020".
- Power is "ON" - Plugs are in receptacles
- Red indicates LED - On

Central Control Board

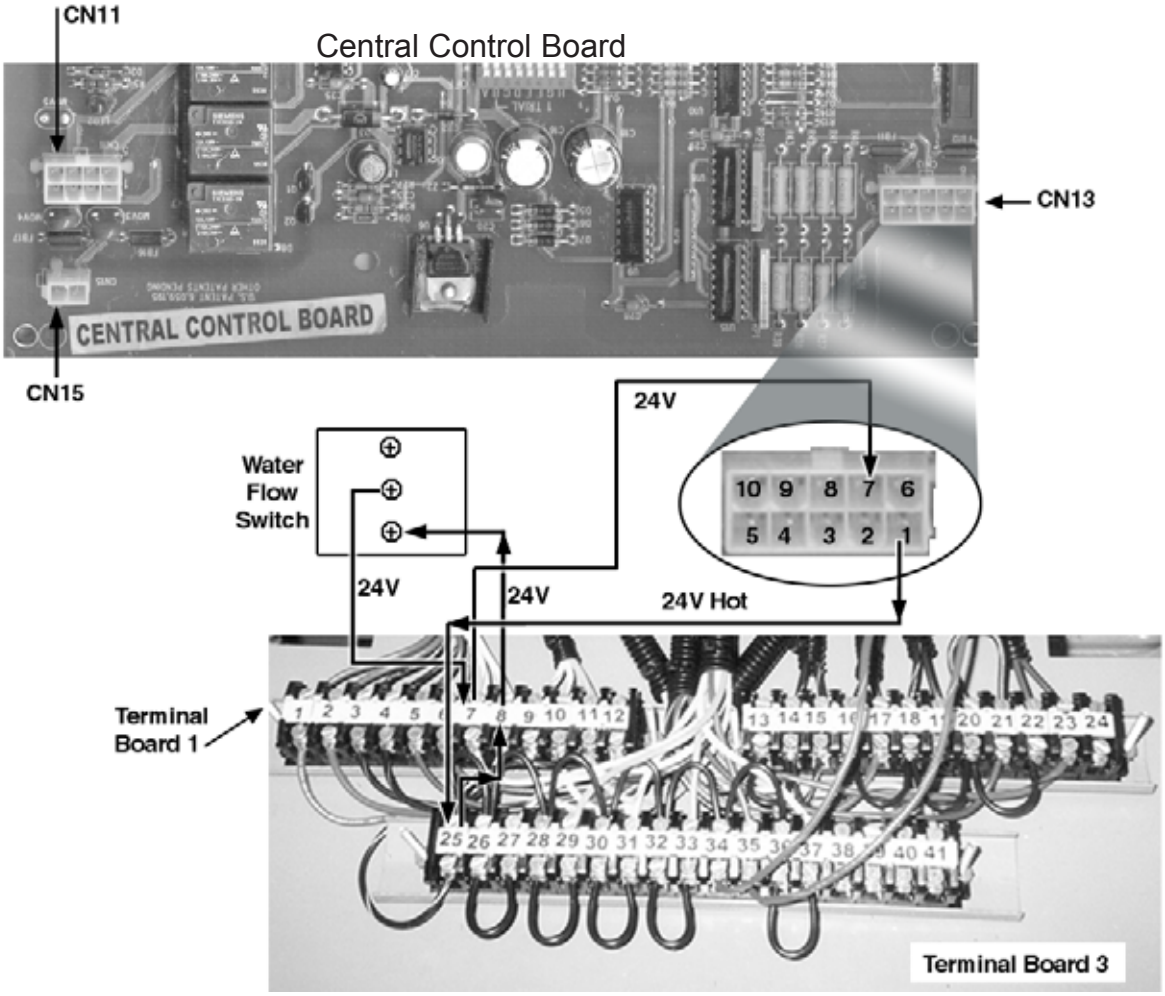


"020" indicates Low Water Cut Off - OPTIONAL CSD1/STANDARD IRI MODELS		
Lockout Status	**If error code is …**	**… then**
Hard	020	• check water level - fill as needed. • check wiring connections and 24V hot from CCB CN11, Pin 5 to TB1, Terminal 11 • check wiring connections and 24V at TB1, Terminal 11 and Low Water Cut Off connection. • if cut off should be closed, check connections and check for 24V from LWCO to TB1, Terminal 9. • check connections and for 24V to CCB CN13, Pin8. • replace board, wiring or Low Water Cut Off as required.

TROUBLESHOOTING ERROR CODES

Error Code "030" - This indicates that the Flow Switch is not closed.

- On Display Board red light is on "Circulation Fail"
- **Display Window** will show "LOCO 030".
- Power is "ON" - Plugs are in receptacles
- Red indicates LED - On



"030" indicates Circulate Fault (Flow Switch)		
Lockout Status	**If error code is …**	**… then**
Soft	030	• check connection and 24V hot from CCB CN13, Pin 1 to TB3, Terminal 25. • check connection and 24 VAC hot from TB3, Terminal 25 to TB1, Terminal 8. • check connection and 24V hot from TB1, Terminal 8 to Flow Switch. • if flow switch is closed, TB1, Terminal 7 to Ground should be 24V. • check connections from TB1, Terminal 7 to CCB CN13, Pin 7. • replace wiring, check board Flow Switch and paddle as required. • check connections (Amp) for conduit assembly

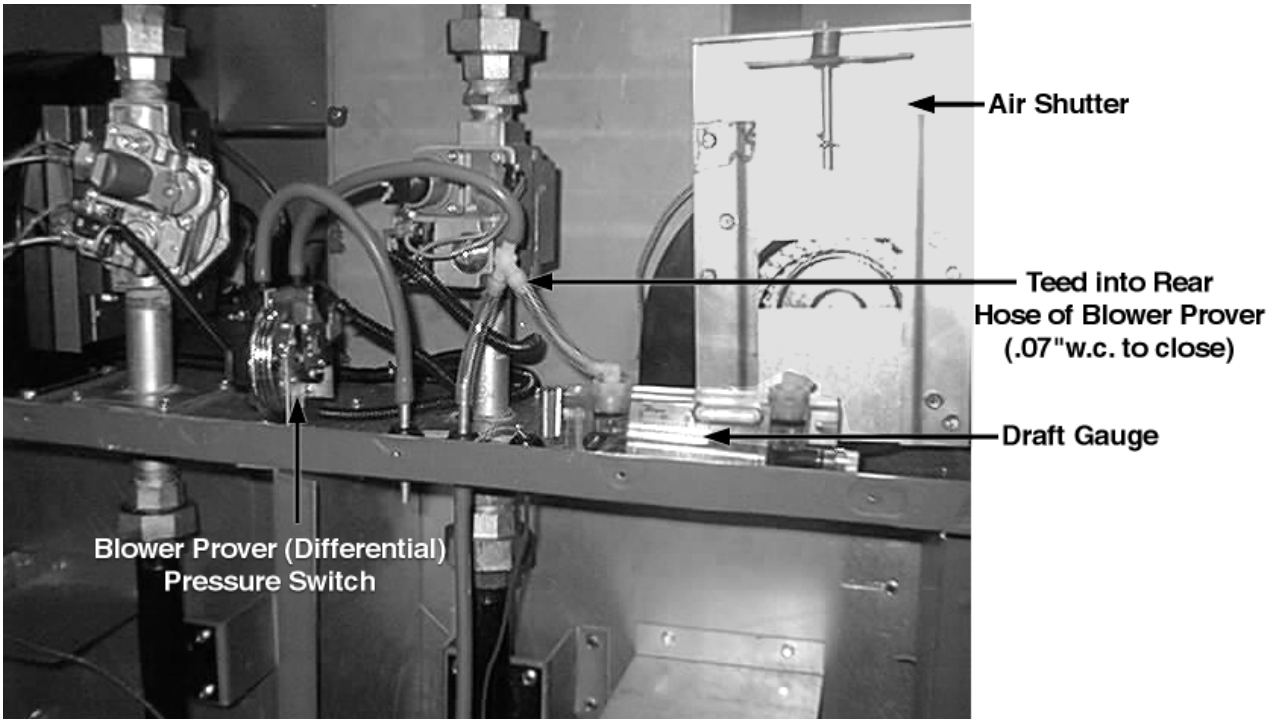
TROUBLESHOOTING ERROR CODES

Error Code "04" Stage 1, 2, 3, or 4 - Indicates Insufficient Air (Air Pressure Switch)

- On Display Board red light is on "Insufficient Air"
- Red LED for indicated Stage - On

"Insufficient Air" relates to pressure at the Blower Prover (Differential) Switch

- **Display Window** will show "LOCO 04?".
- Power is "ON" - Plugs are in receptacles



"04?" indicates Insufficient Air (Air Pressure Switch). Blower prover switch open. Closes at .70 W.C. differential positive pressure. The last number in the code is the Stage (Ex. 041 = Stage 1)		
Lockout Status	**If error code is …**	**… then**
Soft	041 042 043 044	• check air hoses. • adjust blower air shutter to on large blowers. Set blowers to between 1.2 to 1.5" W.C.: for small blower (1000 only) set blower to 1.0 to 1.2" W.C. • check that hose connections are not reversed on Pressure Switch. Burner hose should attach to rear Pressure Switch port. (marked • check for vent and exhaust length. • check for blocked intake or exhaust • check for 24 VAC on TB2 Terminal for Stage. (See diagram). • check negative pressure port of switch. Pressure should be negative. If pressure exceeds + .05" check hose and connections

TROUBLESHOOTING ERROR CODES

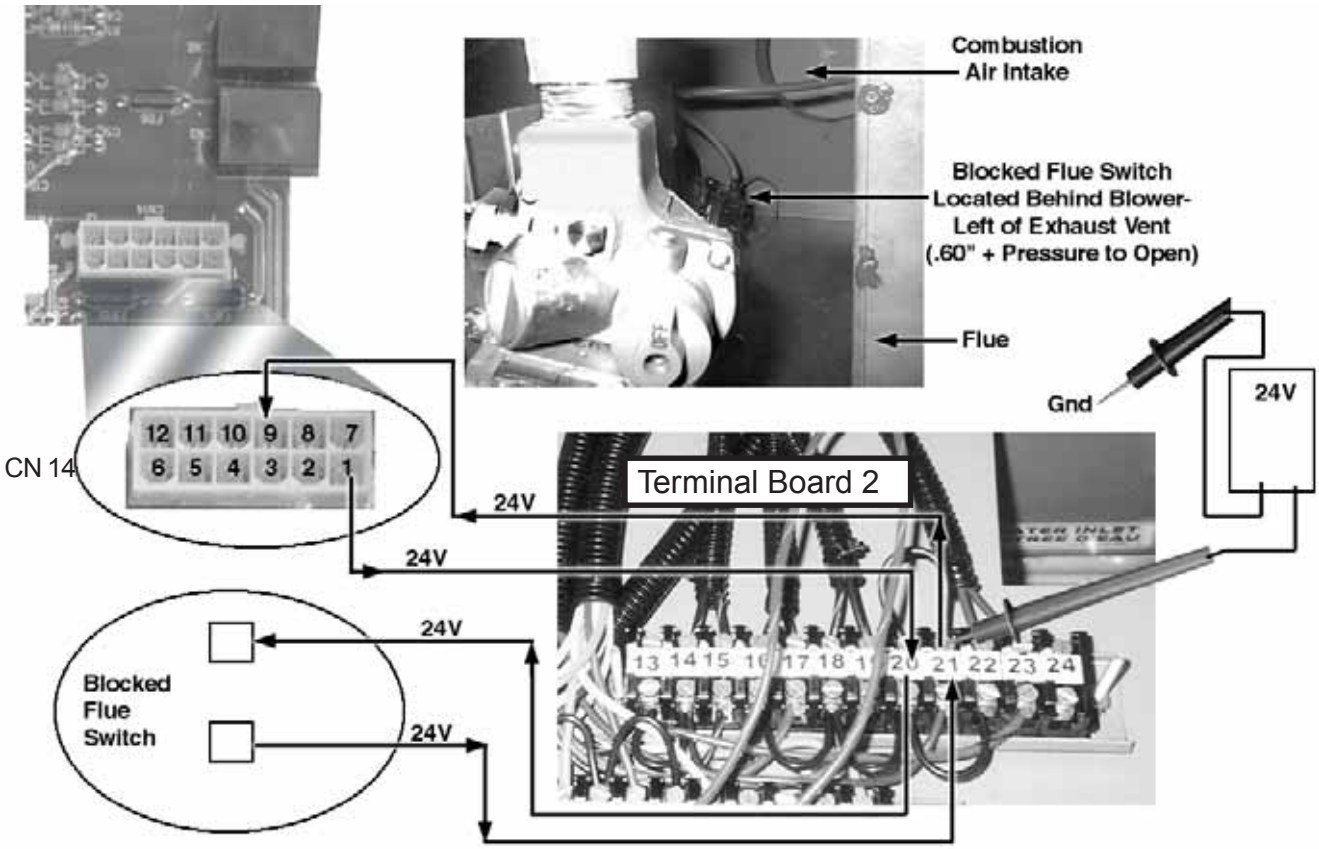
Error Code "060" - This indicates Blocked Flue

- On Display Board red light is on "Blocked Flue"
- Red indicates LED - On
- **Display Window** will show "LOCO 060".

Blocked Flue Switch has opened (.60 + pressure to open). Switch is located to the left of the vent and rear of the cabinet - near air intake opening.

- Power is "ON" - Plugs are in receptacles

Central Control Board

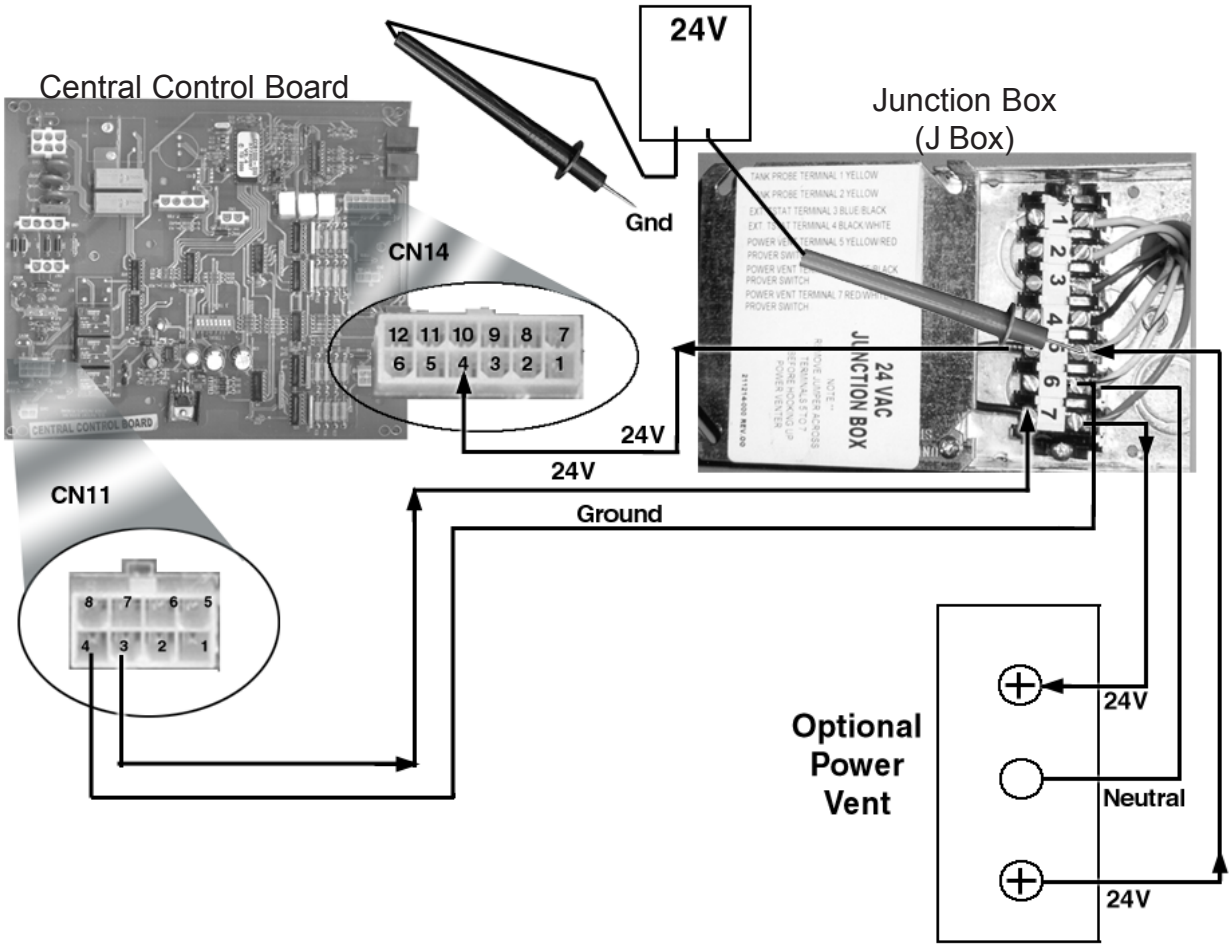


"060" indicates Insufficient Blocked Flue.		
Lockout Status	**If error code is …**	**… then**
Soft	060	• opens at .60 positive pressure • check vent equivalent length • check for blockage • replace switch • if closed, 24 VAC should be present at TB2, Terminal 20 and 21 Both Terminal to Ground • check wiring and 24 VAC from TB2 Terminal to CCB CN14, Pin 9. • check wiring and 24 VAC supply from CN 14 Pin 1 to TB2 Terminal 20. Pin one is actually only sent to one terminal then jumped across to the others.

TROUBLESHOOTING ERROR CODES

Error Code "070" Stage - Indicates Power Vent Problem

- On Display Board red light is on "Power Vent Fail*"
- **Display Window** will show "LOCO 070".
- Only if an optional Power Venter has been installed in the exhaust vent. Power Venter may or may not have been purchased from A.O. Smith. Power Venter Relay would connect to external 24V Junction Box, Terminal 5, 6 and 7. If Power Venter is not being used, a factory installed jumper should be in place between terminals 5 and 7 in the 24V Junction Box.

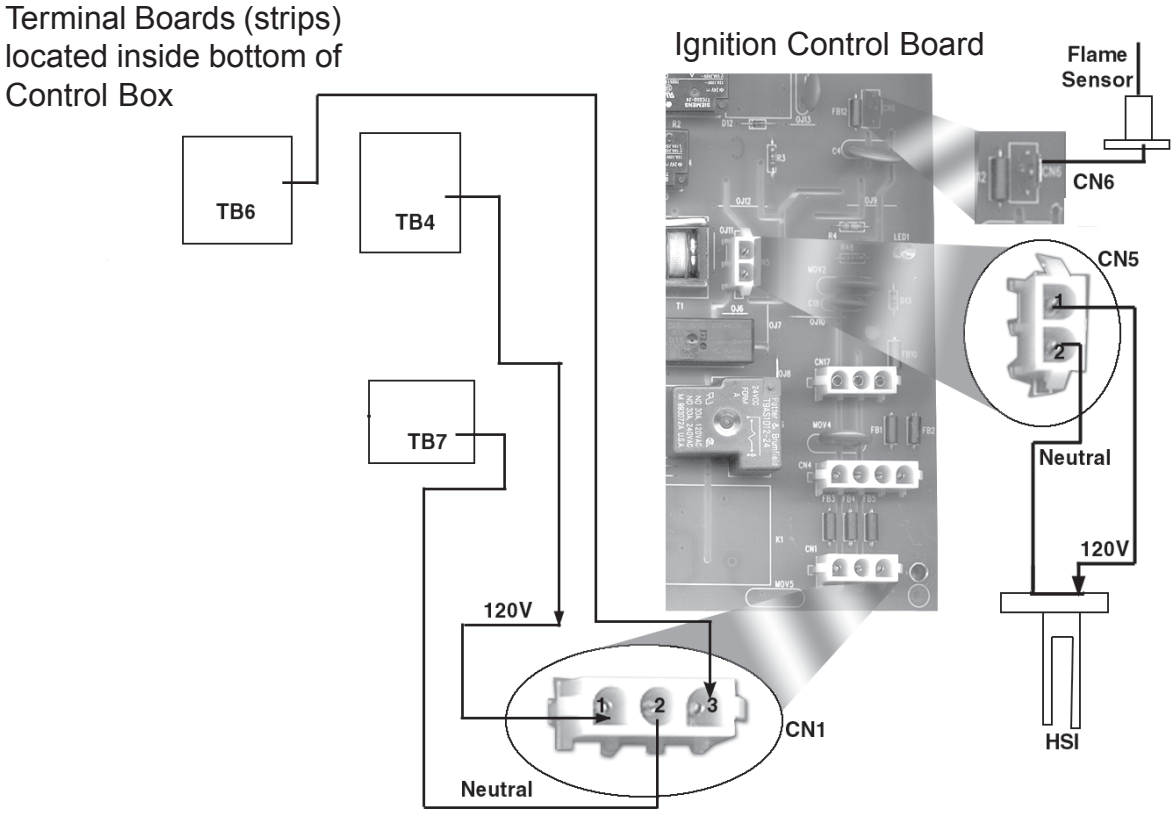


"070" indicates Power Vent Failure.		
Lockout Status	**If error code is ...**	**... then**
Soft	070	• not proving draft ➡ adjust venter air shutter ➡ check for vent blockage (Venter's Proving Switch typically closes at -.05" W.C.) • check total allowable vent length. • check for 24 VAC from CCB CN11, Pin 3 to 24 VAC "J" Box • if Power Venter Pressure Switch is closed, 24 VAC "J" Box, Terminal 5 should have power.

TROUBLESHOOTING ERROR CODES

Error Code "08" Stage 1, 2, 3, or 4 - This indicates Igniter Failure

- On Display Board red light is on "Ignitor Fail"
- **Display Window** will show "LOCO 08". This is an electrical feedback from the HSI.
- Power is "ON" - Plugs are in receptacles
- Red LED for indicated Stage - On

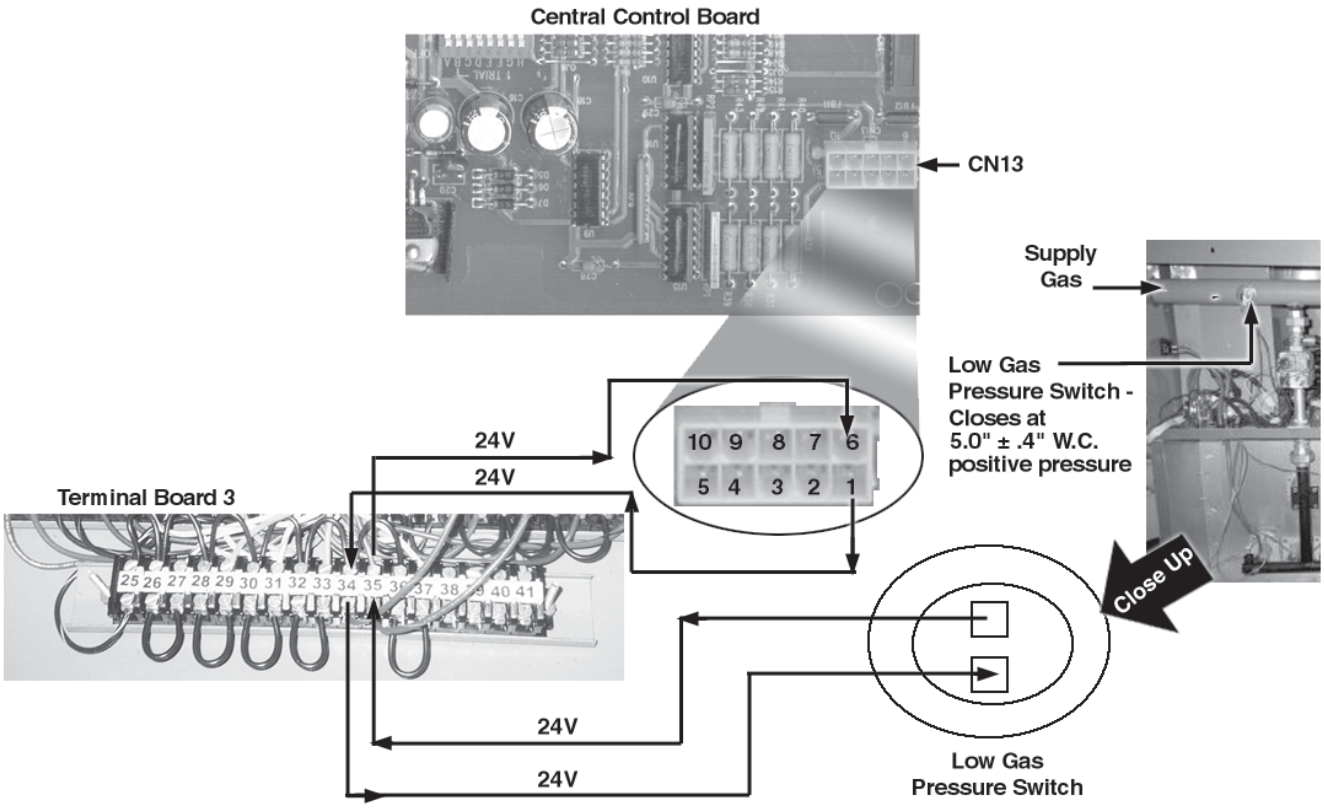


"08?" indicates Igniter Failure. The last number in the code is the Stage (Ex. 081 = Stage 1)		
Lockout Status	**If error code is …**	**… then**
Hard	81 082 084 084	• igniter did not receive 120V or did not stay on. The igniter did not meet the minimum threshold amps of 2.7 to continue(approximately) 23 seconds Pre-"trial for ignition" time • check connection to ICB CN5 of Stage indicated to igniter. • perform continuity check - (40 - 70 Ohms, igniter cold) Check resistance on igniter. • check for 120 VAC to neutral on TB 4 Terminal 1 to ICB CN1, Pin 1 (if not 120V, check F1 fuse) • replace igniter. • replace board or correct wiring as indicated.

TROUBLESHOOTING ERROR CODES

Error Code "090" - Indicates Low Gas Failure

- On Display Board red light is on "Low Gas Fail"
- **Display Window** will show "LOCO 090"
- Power is "ON" - Plugs are in receptacles

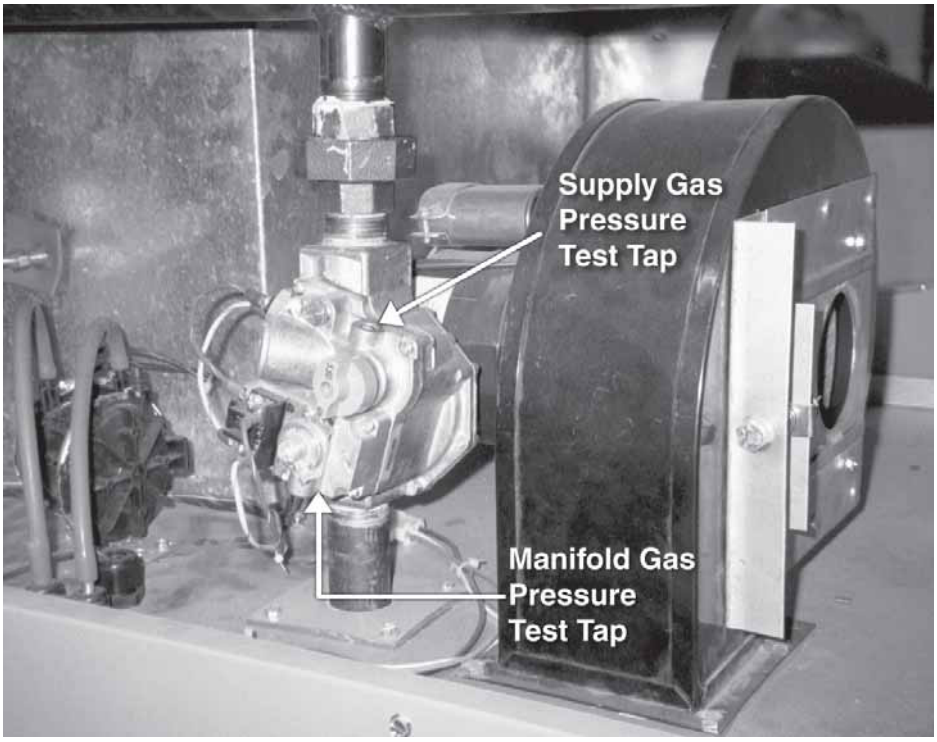

Central Control Board
CN13
Supply Gas
Low Gas Pressure Switch - Closes at 5.0" ± .4" W.C. positive pressure
10 9 8 7 6
5 4 3 2 1
24V
24V
Terminal Board 3
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41
Close Up
24V
24V
Low Gas Pressure Switch

"090" indicates Low Gas Failure		
Lockout Status	**If error code is …**	**… then**
Hard	090	• opens at 5.0 ± .04" W.C. or less. ➡ check flowing supply pressure ➡ check connections to door strip 3 terminal 34 and 35 • check connections and 24V from CCB CN13, Pin 1 • check connections and 24V to CCB CN13, Pin 6 if switch is "closed". • replace low gas switch

TROUBLESHOOTING ERROR CODES

Error Code "10" Stage 1, 2, 3 or 4 - Only Applicable to CSD-1 and IRI Equipped Models

- Display Board Red "High Gas Fail" LED is ON.
- Display window will show "LOCO 10 __"
- Red LED for Stage is ON.
- Power ON - Plugs in receptacles
- High Gas Pressure Switch (one per stage) opens at 5.25" W.C. pressure (12.8" W.C. - Prop)
- Manifold Pressure

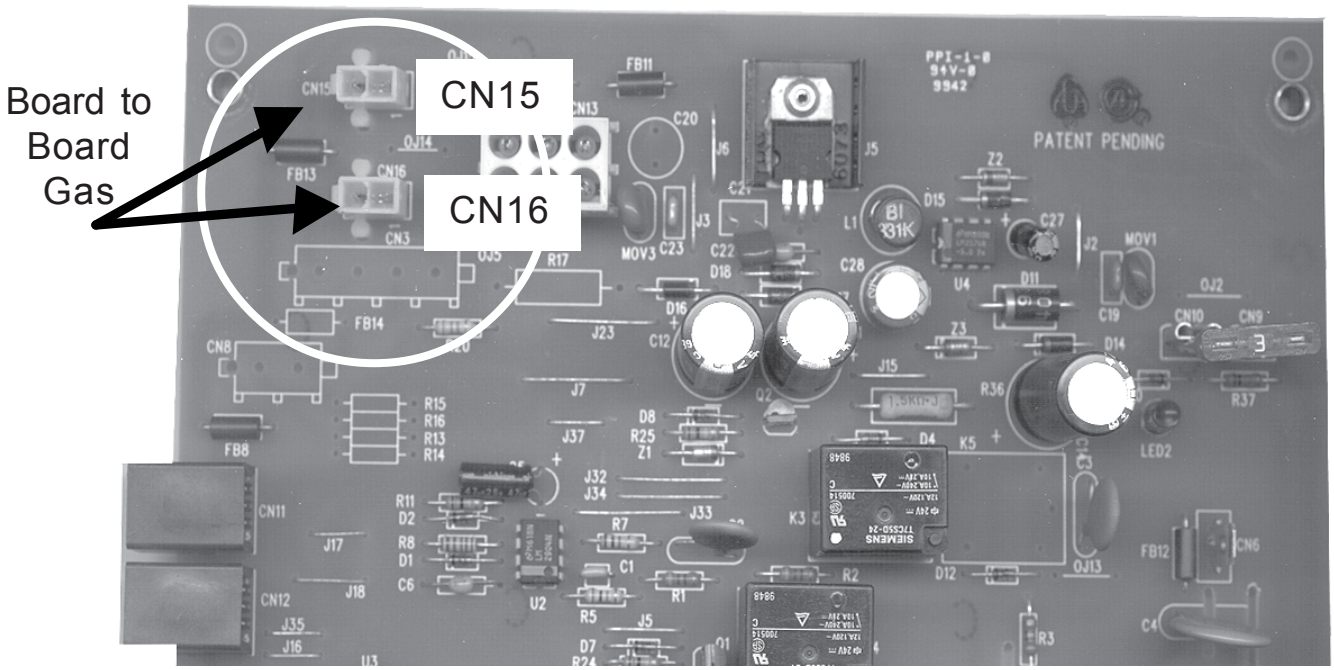


"10?" indicates Excess Manifold Gas Pressure. The last number of the code is the stage (Ex. 0101 = Stage 1) High Gas Pressure Switches are only installed on models with accessories to meet CSD-1 or IRI requirements.			
Lockout Status		**If error code is …**	**… then**
Hard	Stage 1	101	• opens at 5.25" W.C. manifold gas pressure (12.8" W.C. Propane)
	Stage 2	102	• check that supply gas pressure does not exceed 14" W.C.
	Stage 3	103	• check flowing manifold gas pressure.
	Stage 4	104	• replace high gas pressure.

TROUBLESHOOTING ERROR CODES

Error Code "11" Stage 1, 2, 3 or 4 - Gas Valve Relay Failure

- Display Board Red "Gas Valve Fail" LED is ON.
- Display window will show "LOCO 11 __"
- Red LED for Stage is ON.
- Power ON - Plugs in receptacles

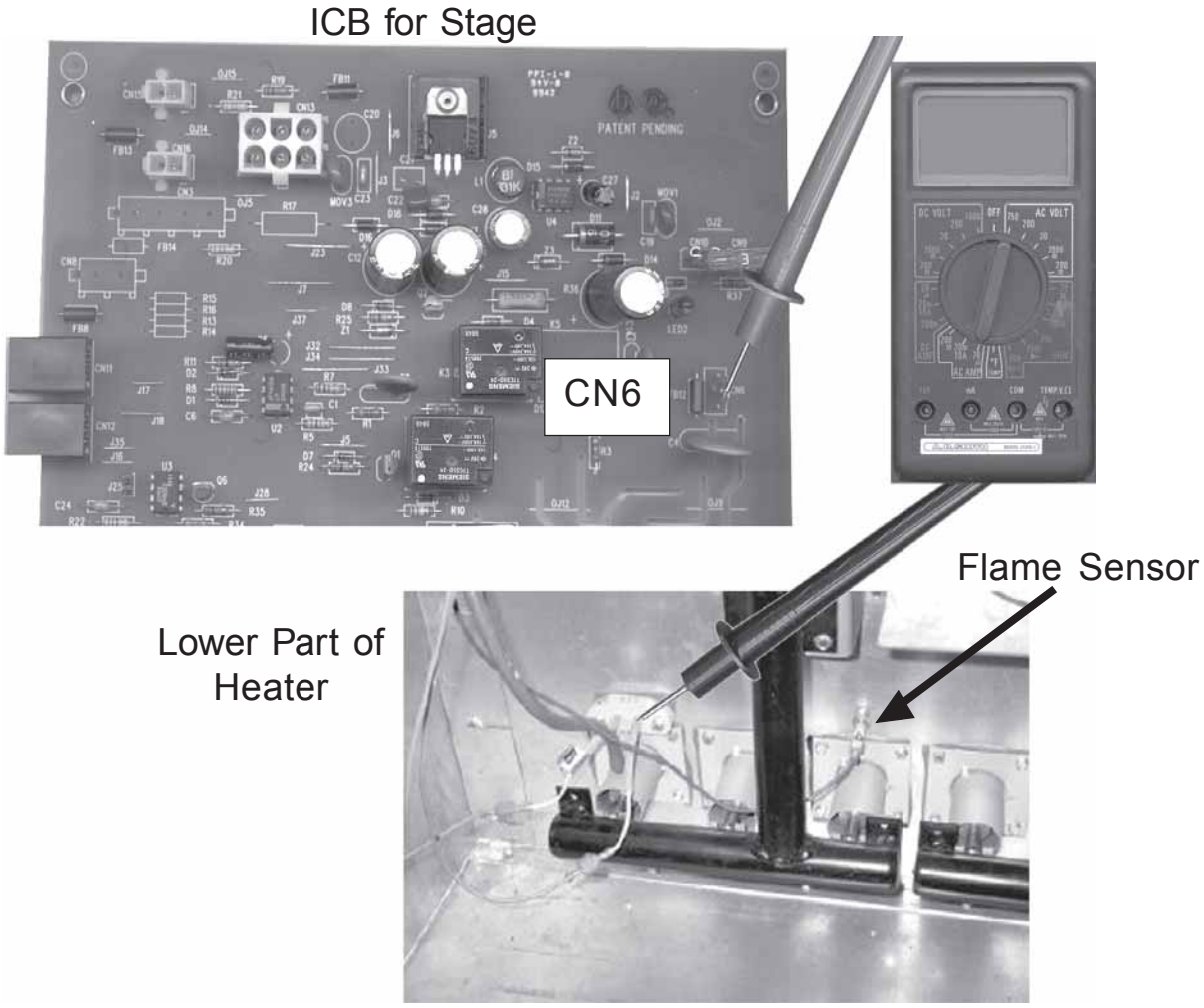


"11?" indicates Gas Valve Relay Failed. The last number of the code is the stage (Ex. 0111 = Stage 1)			
Lockout Status		**If error code is …**	**… then**
Hard	Stage 1	111	check plug connects on ICB for indicated Stage Recepticals CN15 and CN16. replace ICB for indicated stage.
	Stage 2	112	
	Stage 3	113	
	Stage 4	114	

TROUBLESHOOTING ERROR CODES

Error Code "12" Stage 1, 2, 3 or 4 - This Indicates A Flame Failure

- Display Board Red "Flame Fail" LED is ON.
- Display window will show "LOCO 12 __"
- Red LED for Stage is ON.
- Power ON - Plugs in receptacle
- Indicates that flame was sensed but then lost.



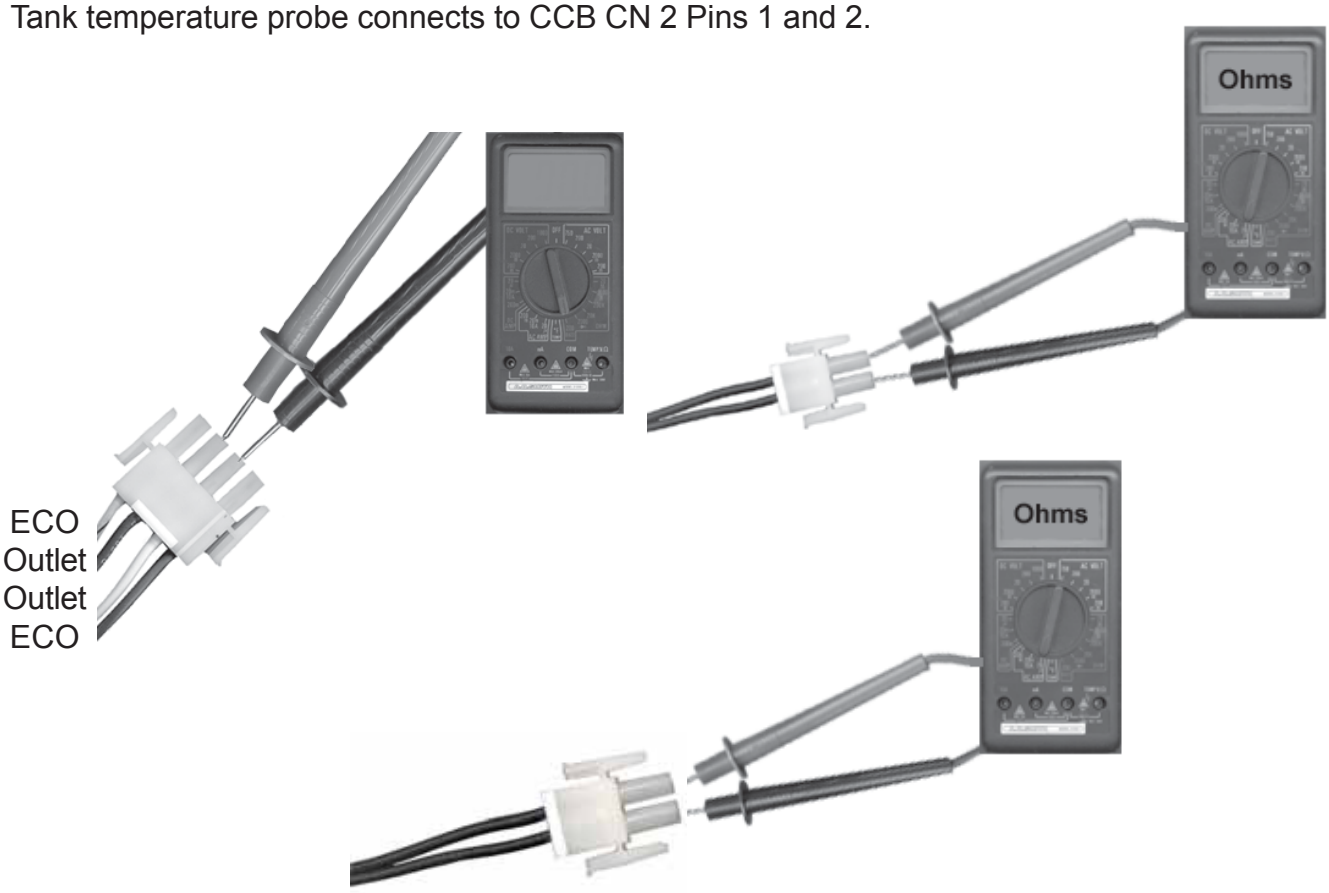
"12?" indicates That Flame Was Sensed But Then Lost. The last number of the code is the stage (Ex. 121 = Stage 1)			
Lockout Status		**If error code is …**	**… then**
Hard	Stage 1	121	• sensed flame present then lost it. Check of 1 micoamp signal to ICB-CN6
	Stage 2	122	• clean sensor to increase signal.
	Stage 3	123	• check wire connect to ICB - CN6.
	Stage 4	124	• replace sensor.

TROUBLESHOOTING ERROR CODES

Error Code "131, 132, 133" - Temperature Probe Faults

- Display Board Red "Temp. Probe Fail" LED is ON.
- Display window will show "LOCO 13 __"
  - Third digit indicates which probe is not being sensed.

- Outlet probe connects to CCB CN1 Pins 1 and 2
- Inlet probe connects to CCB CN1 Pins 3 and 4.
- Tank temperature probe connects to CCB CN 2 Pins 1 and 2.



"131, 132, 133" indicates Temperature Probe Faults.			
Lockout Status		**If error code is ...**	**... then**
Hard	Outlet Probe Thermistor	131	• no temperature (Ohms) sensed from the indicated probe to CCB CN1 Pins 1 and 2
	Inlet Probe Thermistor	132	• perform continuity check of probe ➡ check connections on doorstrip Terminal Board 1 - Terminal 3, 4, 5, 6 ➡ replace probe.
	Remote Probe Thermistor	133	• connects to CCB-CN2 ➡ perform continuity check check connection to external "J" box ➡ replace probe

TROUBLESHOOTING ERROR CODES

Error Code "140" - Industrial Risk Insurance Gas Valve Failure -

IRI Controls are an option on these heaters.

- Display Board Red "Gas Valve Fail" LED is ON.
- Display window will show "LOCO 140"
- "0" in the 3rd position indicates that the Central Control Board is noting-not ICB- A voltage confirmation through the IRI Gas Valve Prover Switch.

"140" indicates No 24 VAC Noted Through IRI Gas Valve		
Lockout Status	**If error code is …**	**… then**
Hard	140	• power off - check wiring and plugs from IRI Gas Valve

TROUBLESHOOTING ERROR CODES

Error Code "210" - Indicates Central Processing Unit (CPU) Fault

- Display window will show "LOCO 210"

The CPU, located on the Central Control Board, has a non-repairable fault. Replace the CCB.

Miscellaneous Information

1. These units require a proper hot (voltage supply), "clean" neutral and proper grounding to operate correctly, to minimize the risk of electrical problems, it is recommended that wiring to this appliance be isolated from wiring to other appliances.

2. Shipping may loosen wiring connections to plugs or terminals.

3. Under certain conditions, low or not gas pressure can result in a "00_" communication error code.

4. Loose or broken receptacles on the CCB or an ICB can result in a "00_" communication error code.

GENERAL INFORMATION

This is the approved factory start-up procedure and certificate for an A.O. Smith GB/GW/GBO /GWO model 1000 - 2500, series 200 & 201 boiler.

IMPORTANT

It is the owner's responsibility to request a factory start-up. The Genesis unit(s) must be fully installed prior to start-up. If the start-up agent cannot perform the start-up after being called and arriving on the scene, due to some lack, such as no gas or water or electricity to the unit(s) the owner will be billed for the start-up agent's time.

NECESSARY EQUIPMENT

- Gas combustion analyzer capable of measuring CO_2, CO and O_2.
- 3 Gauges or manometers capable of measuring gas pressure in inches to tenths of an inch of water column.
- Three ¼" tees and six sections of ¼" silicone tubing, each approximately 1½ feet (0.5 meters) in length.
- Multimeter capable of measuring Ohms and Volts.
- Ampere meter.

REQUIRED ABILITY

Installation and start-up or service of this unit requires ability equivalent to that of licensed tradesman in the field involved; knowledge of plumbing, air supply, venting and electrical work is required.

STEP ONE

Fill in the below information regarding technician performing start-up, model and installation site.

Technician & Model

Date _____ By (Technician's Name) _____

Name of Start-up Company _____

Address _____

City _____ State/Province _____ Zip/Postal Code _____

Telephone _____ Fax _____

Model _____ Series _____ Serial No. _____

Part No. _____ Installation Date _____

DISTRIBUTION

This is a four part carbonless form. Use a ballpoint pen and print clearly to produce four legible copies.

White - A.O. Smith Service Dept.
Green - Start-up agents files
Pink - to remain with boiler
Canary - Owner's copy

LITERATURE

You must have thoroughly read and understood the Genesis installation and instruction manuals provided with the unit and have them available at the time of this start-up. If you are not familiar with powered combustion boilers or water heaters, please contact an authorized A.O. Smith Start-Up Agent for help in the start-up of this unit.

Installation Site

1. Are installation manual and warranty materials available?
   ☐ YES NO
2. Is adequate clearance provided to service the unit?
   ☐ YES NO
3. Are chemical or corrosive materials stored near this unit?
   ☐ YES NO
4. Is there an adequate supply of combustion air for this unit?
   ☐ YES NO
5. Examine the gas supply:
   a. Does the gas supply line meet the manual recommendations?
      ☐ YES NO
   b. Are the regulators vented per Code?
      ☐ YES NO
   c. Are the regulators the proper size, locked-down type and pressure range for the input of the unit?
      ☐ YES NO
6. Do any of the following conditions exist in the water supply system?
   a. High (above 150 PSI/1047 kPa) or rapidly fluctuating water pressure.
      ☐ YES NO
   b. Booster pumps or check valves without expansion tank.
      ☐ YES NO

Note: If YES in "a" or "b" above, initial here_____ that the owner has been notified that corrective action must be taken.

7. Check each of the following that are installed in the water supply system:
   Backflow preventer
   Water pressure regulator
   Expansion tank
   Water treatment device

STEP TWO: START-UP PROCEDURE

Preliminary checks

a) Check that all venting is properly sealed in accordance with the instruction manual.

b) Check electrical power supply branch circuit for the unit to insure that it is a 120 VAC, 60 HZ line rated for 30 Amps or above.

c) Make sure that the unit is filled with water and the water lines have been purged of air. Proper water flow is vital to the operation of this unit. See installation manual for flow requirements.

d) Make sure the unit has not been damaged and that all jacket panels are tightly sealed with all screws in place. If the unit is damaged, an A.O. Smith representative or authorized service agent should be contacted to make repairs before the unit is started.

e) Connect gas supply pressure gauges to check gas supply pressure and gas manifold pressure (see instruction manual).

f) Start unit per instructions provided on Lighting and Operating plate on the unit or the Lighting and Operation instruction provided in the installation manual.

g) The gas supply pressure must be within the following ranges and the required manifold pressure should be as indicated for the gas type listed below:

Gas Type	Maximum Supply Pressure	Minimum Supply Pressure	Required Manifold Pressure
Natural gas	14.0" W.C. (3.49 kPa)	6.0" W.C. (1.22 kPa)	3.5" W.C. (0.87 kPa)
Propane gas	14.0" W.C. (3.49 kPa)	11.0" W.C. (2.74 kPa)	10.0" W.C. (2.49 kPa)

Note: The minimum supply pressure and Required Manifold Pressure refers to pressure when unit is running at full input.

⚠ WARNING

Serious damage to the unit and/or severe personal injury may occur if the gas pressure at the unit exceeds 14" W.C. (3.49 kPa).

Starting the Boiler

Step 1: Make sure the boiler is set for installation. GB models must have dip switches "F" and "G" in the ON position. (GW's in the OFF). If a tank probe is implemented, dip switch "D" must be in the ON position. See references to Central Control Board in instruction manual for summary of dip switch options.

Step 2: Start the unit, see installation manual. When the unit initiates operation all the blowers will come on for approximately 25 seconds for the pre-purge cycle. Check blower pressures to see if they are within acceptable ranges. See Blower and Air Shutter Setting and Adjustment procedure section for instructions. **Note: Blowers should not need adjustment.**

The pressure settings for the blowers should be approximately as follows: Natural Gas Units: 1.2" - 1.5" W.C., except for the smaller of the two blowers used on the 1000 units; the small blower on the 1000 unit should be set between 1.0" - 1.2" W.C.

Propane Gas Units: 0.90" - 1.5" W.C., except for the smaller of the two blowers used on the 1000 units; the small blower on the 1000 unit should be set between 0.75" - 1.2" W.C.

Note: Check the amp draw of each blower after making any necessary adjustments to assure that the maximum amp rating is not being exceeded. Blowers have a rating of 3.6 amps except for the small blower on 1000 unit which has an amp rating of 1.0 amp. If maximum amperage rating is exceeded, close the air shutter until reading is within maximum value.

Blower and Air Shutter Setting and Adjustment

Note: The blowers are factory pre-set and shouldn't require adjustment. The Genesis II units are equipped with multiple blowers; 2 blowers are used on 3-stage units and 3 blowers are used on 4-stage units.

All blowers must be running while balancing. Pressure gauge/manometer should be placed at each blower:

- Remove the ¼" hose from the positive pressure taps on the differential pressure switches. There will be two switches on the 1000 thru 1500 models and three switches on the 1850 thru 2500 models.
- Run this section of ¼" hose from the air chamber tap on the control panel to one side of one of the three tees you brought with you.
- Run another section of ¼" hose from one of the open taps on the tee to the positive pressure tap on the differential pressure switch.
- Run another section of ¼" hose from the last open tap on the tee to the gauge or manometer.

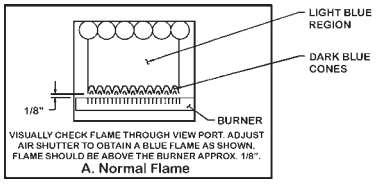

LIGHT BLUE REGION
DARK BLUE CONES
1/8"
BURNER
VISUALLY CHECK FLAME THROUGH VIEW PORT. ADJUST AIR SHUTTER TO OBTAIN A BLUE FLAME AS SHOWN. FLAME SHOULD BE ABOVE THE BURNER APPROX. 1/8".
A. Normal Flame

Figure 1

Once blowers have been adjusted to the proper settings, adjust the air shutters to obtain a "Normal Flame"; that is, a flame that is blue with no yellow tipping and that sits approximately 1/8" (3mm) above the burner deck. Secure the shutters in position.

Burner Characteristics

Check the burner operating characteristics:

A. Normal Flame
A normal flame is blue without yellow tips. The flame will sit approximately 1/8" (3mm) above the burner deck (see figure 1). No adjustment is necessary if Normal Flame is observed. Skip the following and go immediately to **Step three**.

B. Yellow Tips or Yellow Flames
Yellow tips or yellow flames are caused by a lack of air to the burner. If Yellow tips or yellow flames are observed:
   i. Check manifold pressure setting and correct if not properly set.
   ii. Check burners and air intake for blockage and clear.
   iii. Check blower settings and air shutter settings. See instructions below for setting blowers and adjusting air shutters.

C. Lifting Flames
Lifting flames are caused by overfiring the burners or excess air. If Lifting flames are observed:
   i. Check manifold pressure setting and correct if not properly set.
   ii. Check blower settings and air shutter settings. See instructions below for setting blowers and adjusting air shutters.

STEP 3: START-UP RECORD AND DISPOSITION

Once flame characteristics are now correct, record the following values for the unit:

Gas supply pressure	_____ inches W.C.		
Manifold pressure	_____ inches W.C.		
CO_2 reading at full input			
CO reading at full input			
O_2 reading at full input			
Temperature setting			
Water Temperature Rise Across Unit			
Blower Amp Readings	**Blower #1**	**Blower #2**	**Blower #3**
Main Supply Amp Reading			

Allow the unit to run until the system is satisfied and the unit shuts off. Measure the water temperature at the outlet: _____.

Shut down heater as described in the instruction manual. Reinstall all regulator plugs and insure that pressure settings do not change as the plugs are installed. Seal regulator plugs with fingernail polish or model paint. Mark the adjustment of air shutters using a magic marker and seal adjustment screws with nail polish or model paint.

Remove the hoses and tees used to test blower pressure, if used, and make sure that hoses are correctly run from air chamber tap to the positive pressure tap on the differential pressure switch.

RECORD STAGE DIFFERENTIAL SETTINGS
(See Instruction Manual for additional information.)

Stage #1 Differential: _____ Off Temp: _____ On Temp: _____

Stage #2 Differential: _____ Off Temp: _____ On Temp: _____

Stage #3 Differential: _____ Off Temp: _____ On Temp: _____

Stage #4 Differential: _____ Off Temp: _____ On Temp: _____

DISPOSITION

All tests and values specified must pass prior to issuing this Start-Up Certificate. For any of the failed tests, explain below what was done to correct the problem. Also, explain what was done to correct any combustion problems.

_____

_____

_____

_____

_____

_____

_____

_____

NOTIFICATION (When applicable)

The owner has been notified that corrections must be made to this installation. The owner acknowledges that changes must be made within
30 60 90 (circle one) days.

_____ _____
Owner's signature Date

STATEMENT OF COMPLIANCE

I, the undersigned, certify that the water heater listed and described above has been started in accordance with this form and the literature provided and that all measured values and requirements are within the manufacturer's specifications.

_____ _____
(Signature) (Date)

TABLES

GAS VALVES				
Gas	**Vendor**	**Model**	**Electric**	**Comments**
Natural	White Rogers	36C 68-820	24V; 60 Hz; .6A Coil - 180Ohms	3/4" x 3/4"; 3.5" W.C.
Propane	White Rogers	2000 DERHC 5N2	24V; 60 Hz; .6A Coil - 180Ohms	3/4" x 3/4"; 10.0" W.C.
Natural	Robert Shaw	7000 DERHC	24VAC; .7A Coil - 70 Ohms	1" x 1"; 3.5" W.C.
Propane	Robert Shaw	7000 DERHC-LP	24VAC; .7A Coil - 70 Ohms	1" x 1"; 10.0" W.C.

Note: White Rogers Gas Valves are assoicated with 3 burner manifolds.
Robert Shaw Gas Valves are assoicated with 4 or 5 burner manifolds.

BLOWERS				
Model	**Electrical**	**HP**	**RPM**	**Comments**
FASCO 2082-6433 (all models)	3.6A/115V/60Hz	1/4	3400	Same as Genesis 500, 650, 750
FASCO 7062-4361 (GW, GB-1000 only)	1A/115V/60Hz		2650	Genesis 1000 only. Same as Genesis 200 - 400

PUMP - GW MODELS ONLY				
GW Models	**HP**	**Vendor**	**Impel**	**Electrical**
1000 - 1500	1/2	TACO Model 1635-521 or equal	4.70 Dia.	120V, 60Hz, 1725 RPM, 7.0/3.5 Amp
1850-2500	1	TACO Model 1635-522 or equal	5.80" Dia.	120V, 60 Hz, 1725 RPM, 13.4/7.9 Amp

PRESSURE SWITCH INFORMATION	
Pressure Switch	**State/Set Points**
Blower Prover (Differential), Nat.	N.O., .70 ± .05" W.C. to close
Blocked Flue	N.C., .60 ± .05" W.C. to open
Gas Pressure (IRI, CSD-1 only)	N.C., 5.25 ± .04" W.C. to open
	N.C., 12.8 ± 1.0" W.C. to open
Low Gas Pressure N.O.	5.0 ± .4" W.C.. to close
N.O.	10.5 ±" W.C. to close
Blower Prover, Propane (Differential) N.O.	10.5 ± .05" W.C. to close

Visit the “Information Central” link of
www.aosmithwaterheaters.com for a listing
of available Service Handbooks.

Prepared by the Technical Training Department
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www.aosmithwaterheaters.com

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